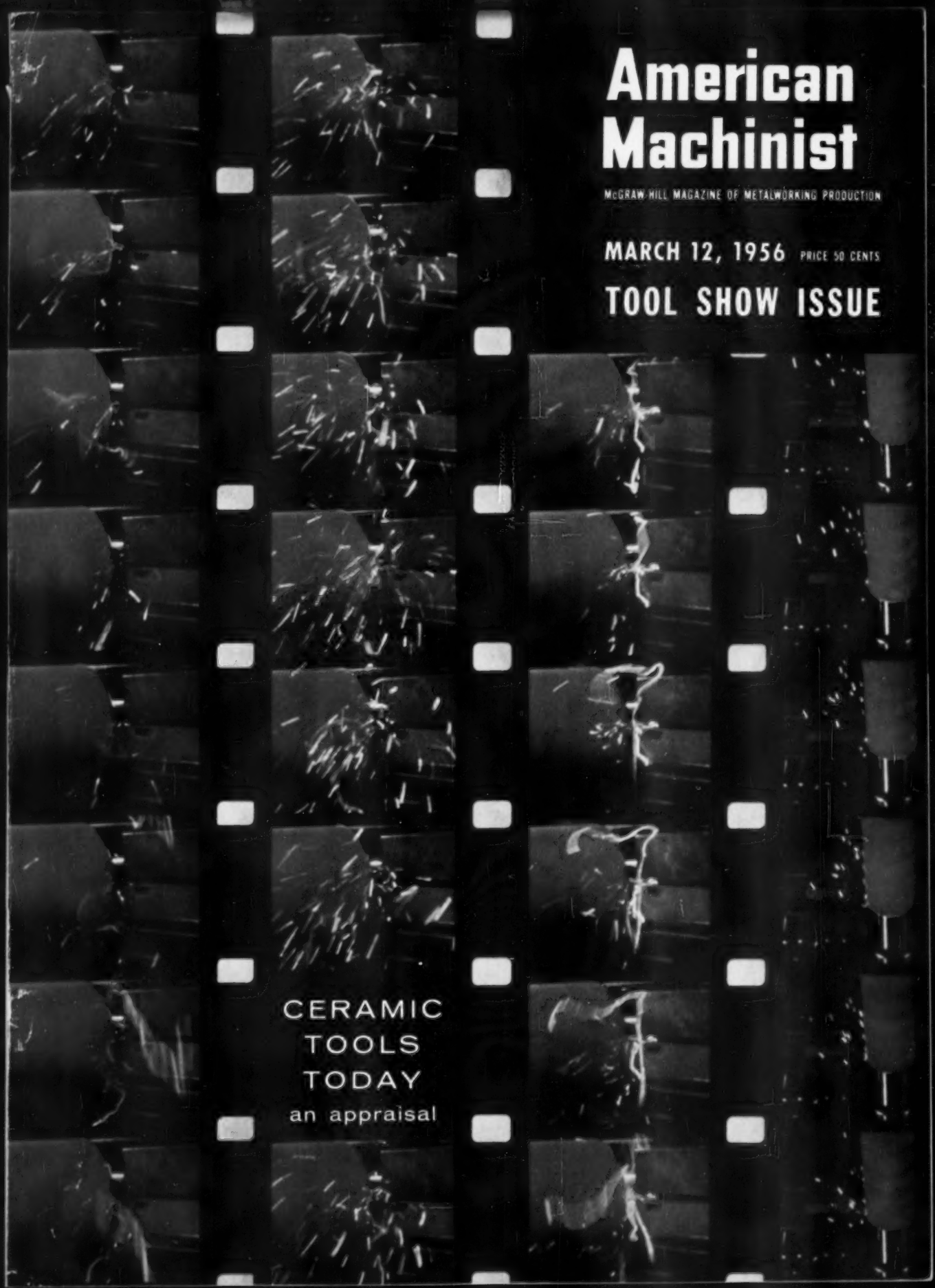

American Machinist

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

MARCH 12, 1956 PRICE 50 CENTS

TOOL SHOW ISSUE

CERAMIC TOOLS TODAY

an appraisal

Exit...

ONE SITTING DUCK

A message of importance to all contestants in the battle against high production costs

PIT A World War II plane against a modern jet fighter and what have you got? One sitting duck! Why? Not because the "prop job" got any *slower*. But because the modern supersonic jet got so much *faster!*

So it is with machine tools. The machine you bought ten years ago may still be working just as good as ever. Yet by today's standards of production speed and economy, that same machine can be *losing money* — perhaps more than a new machine would cost.

This "creeping obsolescence" can often go unnoticed—particularly on small-lot and tool room machines that are not geared directly to a fast-moving automated production line. So take a good look at the old universal Bore-Matics, Rotary Surface Grinders, Tool-Room and Plain Internals in your shop. Check their production and maintenance costs. The results may surprise you.

Your Heald sales engineer will be glad to help you evaluate these machines, fairly and squarely — to show you whether they are earning money for you, or losing it. If you find that you're *paying* for a new machine, you might as well *have* it!

IT PAYS TO COME TO HEALD

HEALD®

THE HEALD MACHINE COMPANY

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NUMBER OF COPIES PRINTED THIS ISSUE 41,740

chips

CERAMIC CUTTING . . . The strips of movie film on our cover show cemented-oxide tips undergoing tool life machinability tests. Tony Tenerowicz, Carboloy's photographer, tried every trick in the book in his effort to stop the chips with dismal results. Success finally came with a 16-mm movie camera and Kodachrome film. The right-hand strip was shot from the top of the machine head, the others were shot from the floor. Machine components and tool shank were painted to provide contrast.

TOMORROW'S TOOLS? . . . Since we first reported success with ceramic tools a little more than a year ago, they have become the hottest subject in Metalworking. To bring you up-to-date, we lead this Tool Show Issue with 22 pages packed with news about these, and other new tool materials. First, Executive Editor E J Tangerman has rounded up all the essential data from previous articles combined with much new information. Next, we bring you first results of detailed tests that compare the new materials with carbide and high-speed steel. Finally, there is an application story from the Skoda Works in Czechoslovakia.

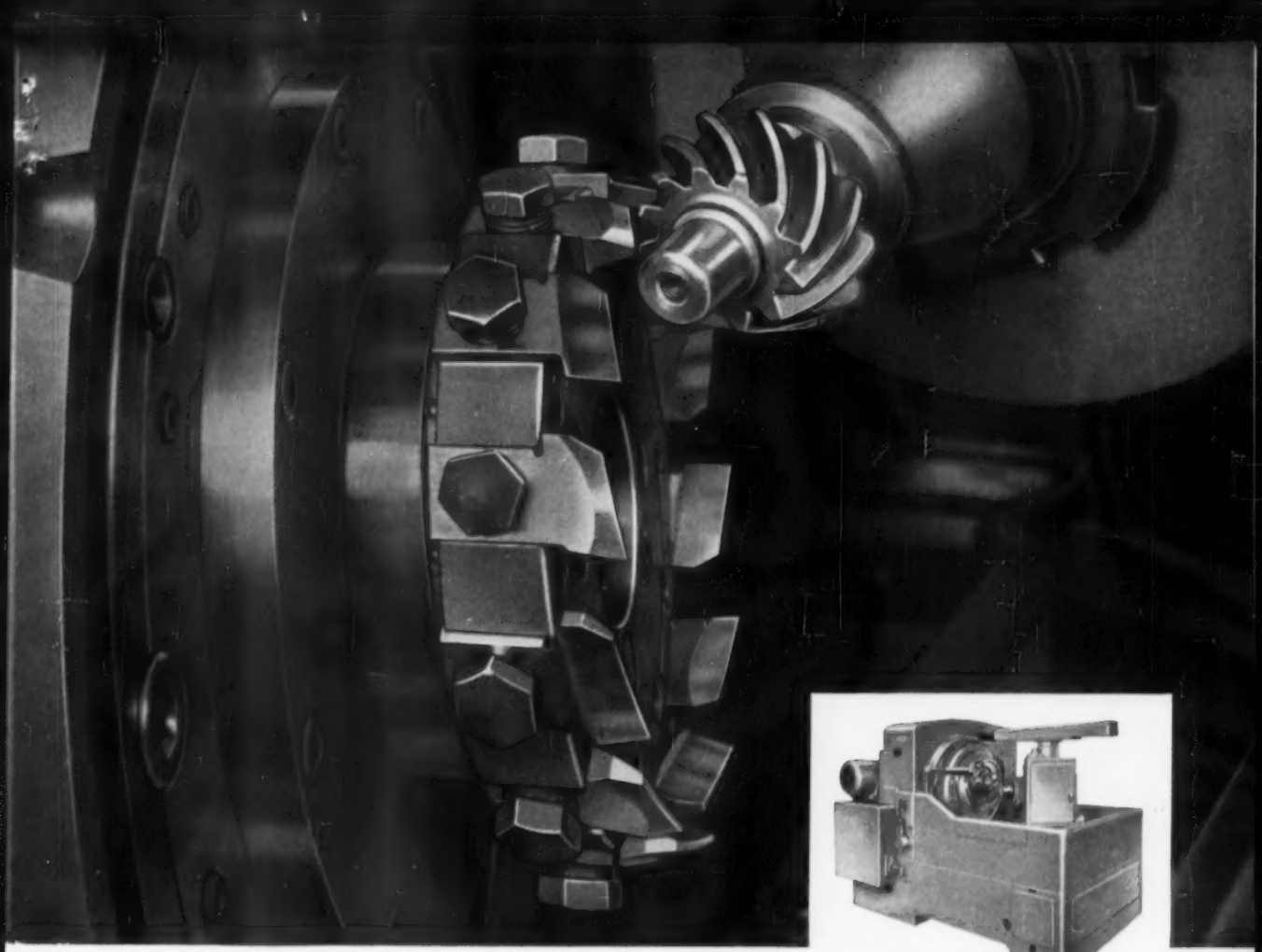
COVERING A SHOW . . . A case history tells how Standard Pressed Steel organized a 20-man team to cover the Machine Tool Show in Chicago and what they accomplished. It may give you ideas on how to handle next week's Tool Show, also in Chicago. . . . A big help to you will be our "Show-in-Print" that describes the *new* equipment you will see there. This section is 24 pages, and bursting at the seams. . . . We might remind you that copies of "Where to Eat in Chicago," published last August are still available on request, or pick one up at Booth 378 at the Show.

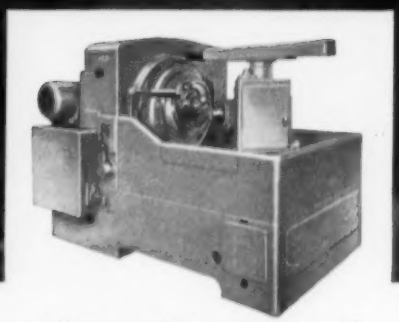
SUPERALLOYS . . . When we were collecting information for our report on how to work superalloys (*AM*—Oct 24 '55, p137), we found that much basic work on machining problems had been done in the Process Development Laboratory at GE's Jet Engine Dept. That report included much of their specific information on different alloys, but we felt you would find a summary of the basic principles they have evolved for handling the high-temperature metals useful. R D Halverstadt (see biography) has filled it with good pointers.

OTHER TOOLING . . . This issue is so packed with new ideas it is hard to single out the stories to call to your attention. You'll find Paquin's discussion of the 4th of 14 steps to design a die. This deals with the piercing punch, often the weakest link and hence the one most in need of careful study . . . the story of how Bell Aircraft rebuilt a thread grinder to hold 0.000020 in. . . . how Johnson got the noise out of outboard drives with close control in bevel gear production.

COMING . . . *AM* for Mar 26 will feature a Special Report showing how machining conditions prior to grinding can influence the life of ground machine ways. You'll also find a simplified discussion of chip formation, two interesting approaches to multiple drilling operations, a discussion of machine-tool vibration, and some ideas on annealing boxes.

R D HALVERSTADT was born in Warren, Ohio and served a 4-year apprenticeship with Republic Steel Corp (with a 3½-year intermission for Coast Guard service on LST's), then worked as a journeyman machinist while going to Case Institute and earning his degree in mechanical engineering. Bob joined the Aircraft Gas Turbine Div of the Jet Engine Dept of GE in 1951, working on design. Since 1953 he has been supervisor of the metal-working laboratory. From the work this laboratory has done with the superalloys, comes his article on machining these high-temperature materials. He is a registered professional engineer.





Jobbing or production quantities are efficiently handled with the new Gleason No. 106 Hypoid Generator.

This new generator cuts medium-size bevel gears *faster than ever!*

Several things have been done to make this new Gleason No. 106 Hypoid Generator the fastest machine for producing medium-size bevel gears.

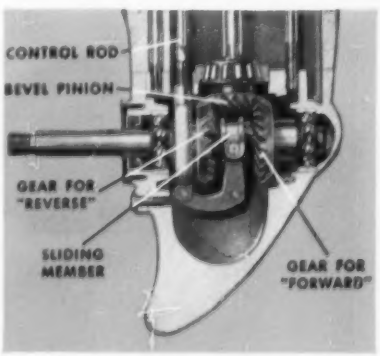
For example, new generating and feed mechanisms coupled with rigid construction give more efficient cutting cycles, speeding up cutting time. In addition, the new generating method assures excellent finish, and maximum cutter life.

Few adjustments required

Since fewer adjustments are necessary, faster setup and change-over are attained.

Extreme operating flexibility is one of the outstanding features of the 106. This permits its use for jobbing, production and completing. When it is arranged for completing, gears are finished directly from the solid blank.

This machine handles gears from 2″ to 8½″ diameter, 4DP and finer, with ratios up to 10/1, cone distances up to 5¼″. We will gladly send you more details on request.



Spiral bevel gears similar to those in this outboard motor drive are cut accurately and quickly on this Gleason machine.

GLEASON WORKS

Builders of bevel gear machinery for over 90 years

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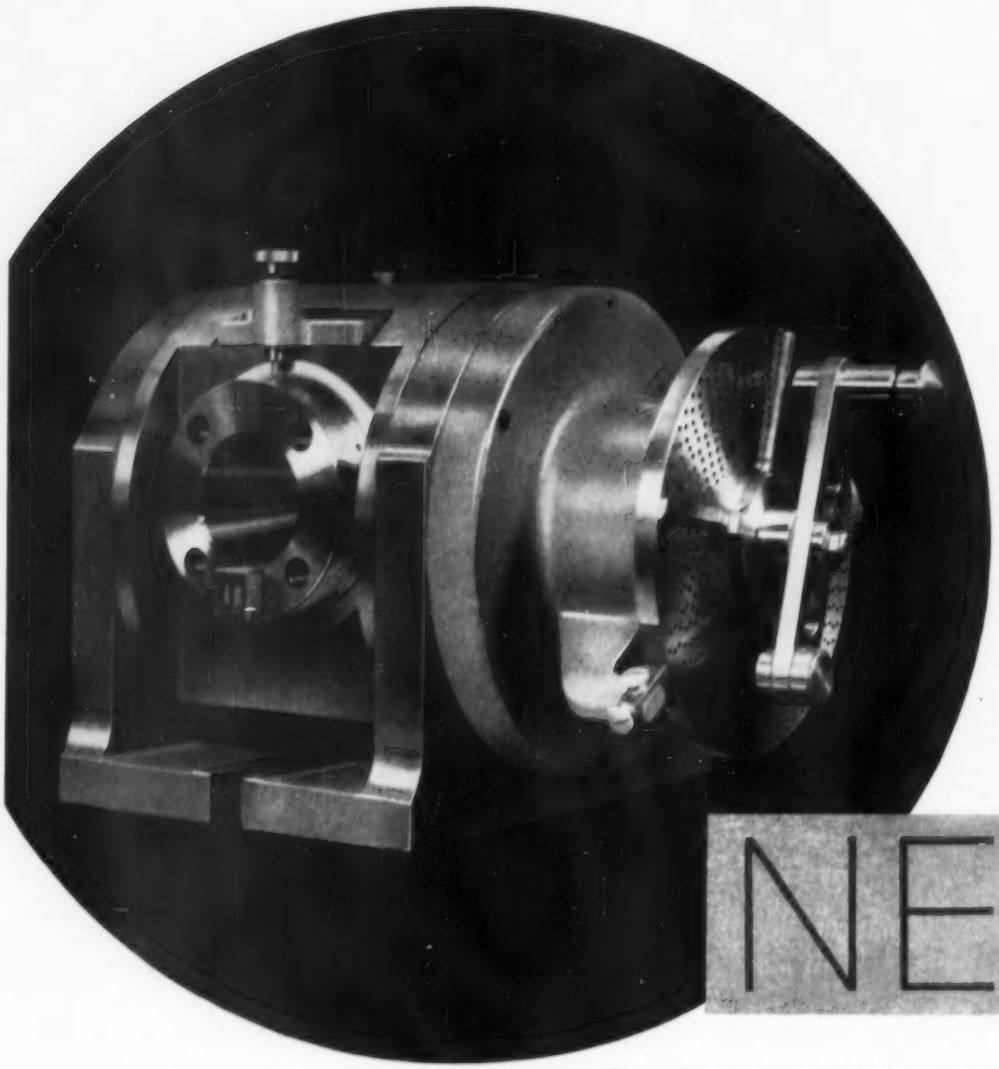


NEW

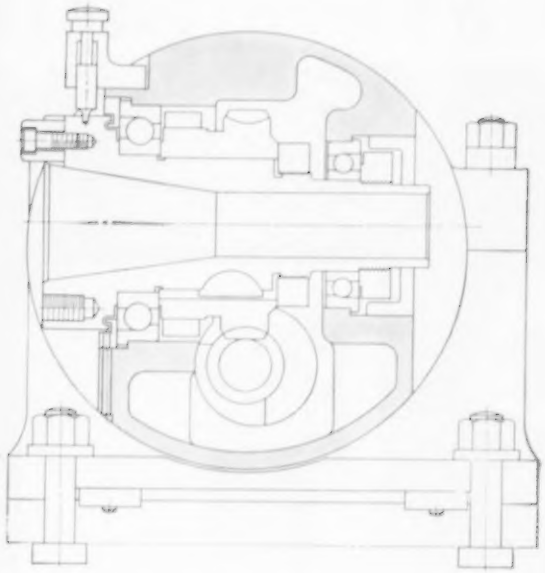
Ruggedness and a high degree of accuracy are skillfully combined in the new CINCINNATI Dividing Heads. They're as much at home in a heavy helical milling setup as the light duty setups ordinarily associated with high precision equipment. And they're handy to have around for many types of inspection jobs. Of course, you'll want to know why, so here's a line-up of the new CINCINNATI design features and their advantages:

Precision anti-friction bearing spindle smooths out the cutting action when taking heavy helical cuts . . . **No. 50 Series spindle taper** takes standard arbors and adapters . . . **milling machine type spindle nose,** with driving key, simplifies mounting of work hold-

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI

MILLING MACHINES • CUTTER MACHINES • FLAME HARDENING



Inside the new CINCINNATI Dividing Head.

Sets a Higher Standard for your Toolroom Work . . .

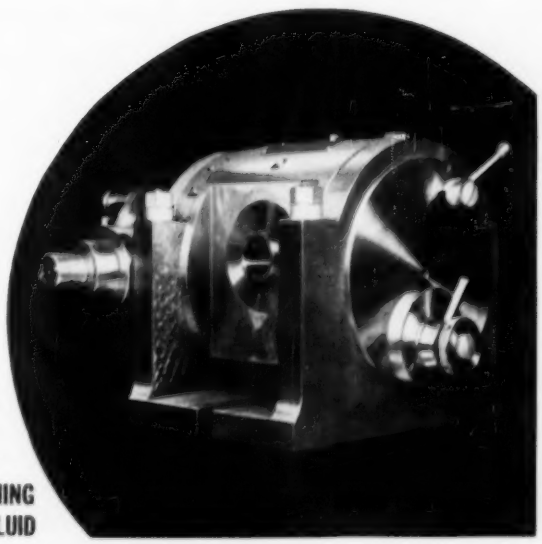
CINCINNATI DIVIDING HEAD

ing devices . . . **direct indexing,** for low numbers, on spindle nose . . . **completely enclosed mechanism** keeps out chips and grit and retains Cincinnati's famous dividing head accuracy

And here's another advantage that will be doubly welcome by your engineering department . . . it will not be necessary for you to change a single engineering drawing or methods procedure. The index plate and sector on the new CINCINNATI Dividing Heads are the same as before, and the worm and wheel ratio remains at 40 to 1.

Would you like to know more about the new CINCINNATI 10", 12" and 14" Dividing Heads? Write for publication No. M-1924.

CINCINNATI 9, OHIO



Rear view. Spindle clamping lever, top; worm disengaging lever, below.

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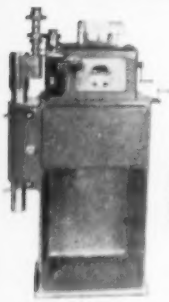

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Red Liners

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Instruments

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MARCH 19th - 23rd

THE
PRECISION
LINE

WEIGHT IN PROFITS

Fellows Gear Inspection Instruments with Chart Recorded Proof of Gear Accuracy

Deviations of the "red line" on a chart from a Fellows Gear Inspection Instrument, not only warn of costly gear errors–but indicate the nature of that error. Proper adjustments can thus be made immediately before expensive rejects accumulate in long production runs.

The use of Fellows Gear Inspection Instruments to continually "spot check" gears keeps waste of time, labor and materials to a minimum... provides undeniable chart recorded proof of gear accuracy... guarantees superior performance for the life of your product.

- **For composite check,** FELLOWS RED LINERS record gear errors in combination on a chart as the precision master rotates in intimate contact with the gear being checked. 3 models to 18" p.d.
- **For checking lead,** FELLOWS LEAD MEASURING INSTRUMENTS check various leads–also crown and taper. No involved calculations required. Errors charted by an electronic recorder at 500 to 1 magnification. 12", 24" p.d. models.
- **For checking involute profiles,** FELLOWS INVOLUTE MEASURING INSTRUMENTS check accuracy of involute profiles–also location of involute modifications. Electronically provide charts at 500 to 1 magnification. 12", 24" p.d. models.

There's a Representative in any Fellows office who will be glad to show you how to operate Fellows Inspection Equipment... and just how, in your operation–Fellows Gear Inspection Instruments can be "worth their weight in profit".

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Fellows *Gear Production Equipment*

VERSA

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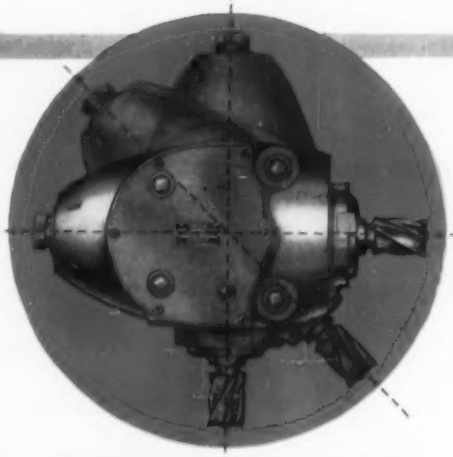
One Van Norman Ram Type Miller Gives You the WORKABILITY of TWO Single Purpose Machines PLUS Angular Milling



Van Norman exclusive adjustable cutterhead permits horizontal, vertical or angular milling on one machine without attachments.

This No. 38M big three purpose miller costs you only $1.07 per hour to own after minimum down payment on a 5-year-conditional sales contract.

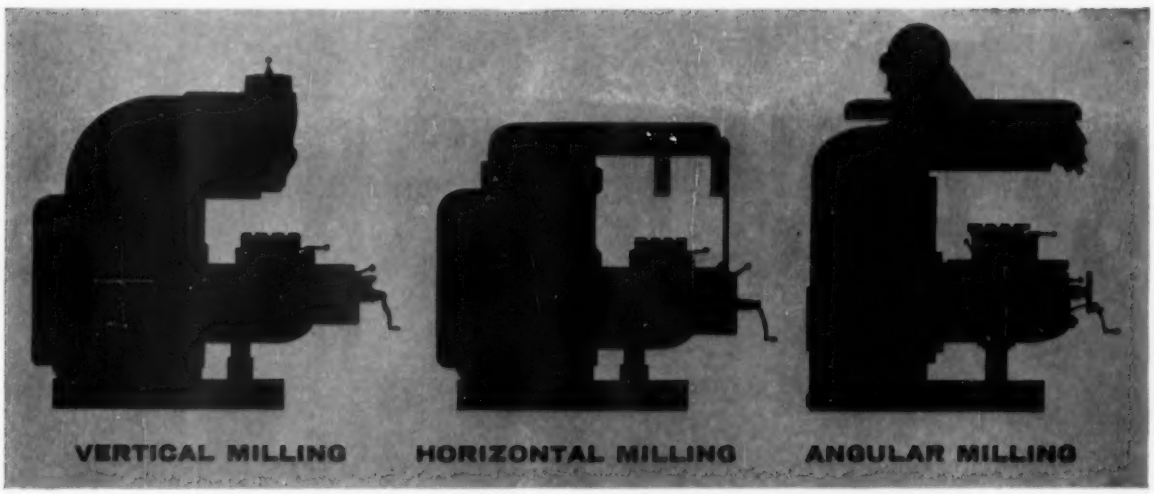
NO. 38M
Table Size: 64" x 14"
Spindle Cutterhead motor: 10 HP
Ram Travel: 29"
Speeds: 12
Feeds: 18

VAN NORMAN MACHINE

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

TILITY

Saves Your Machine Dollars...



You do them all on one Van Norman Ram Type Miller

Regardless of the type of plant or type of work, a Van Norman Ram Type Miller can cut your milling costs and speed production. These versatile millers reduce idle machine time by as much as 50%.

But that's not all — with a Van Norman you save on capital expenditures, too! Here's how — with one Van Norman Ram Type Miller you can do horizontal, vertical as well as angular milling without attachments . . . all on *one* machine. This means less machine purchase dollars needed, more overall production from each miller because there is *no waiting* for single purpose machines.

Find out how you can profit with a Van Norman Ram Type Miller. They are available in 14 basic models . . . a size to meet your particular requirements.

Write for full information, today.

Don't wait . . . for extra profits, install a Van Norman now!
They are available on five purchase plans — Outright sale . . .
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See your dealer or write Van Norman Company.

Lease and Conditional Sales Contracts not available to Export.

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SPRINGFIELD 7,
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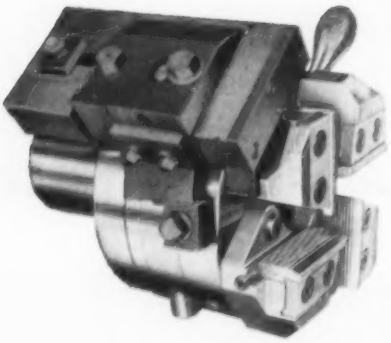

STAINLESS STEEL

These
THREADING
TOOLS
displayed
at Booth 578
ASTE Show

TAPERED THREADS

cut with Better Finish
Longer Tool Life

1½" Tapered Pipe Threads are cut in 304 stainless steel reducing bushings at Camden Machine Company, New Haven, Conn. These threads are produced by a 1¼" LANDMATIC Taper Attachment Head on a 3¼" Gridley single-spindle automatic at 15 surface feet per minute.

The thread finish is greatly improved from previous methods and 1000 pieces are completed between chaser grinds—an increase of more than 10 times.

These improved results can be entirely attributed to the use of the Taper Attachment and the free cutting action of the Landis Tangential Chaser. In operation, as the die head advances onto the workpiece, the movement of the die head cam along the cam follower of the taper attachment expands the chasers on diameter. This produces a tapered thread corresponding to the taper of the cam follower. Cutting action is limited to the throat section or chamfer of the chaser, allowing the thread to be cut quickly with little "cold-working." This action reduces cutting strains to a minimum and results in uniform tapered threads.

LANDIS Taper Attachment Heads are stationary self-opening heads for cutting tapered threads of all types. Six sizes of heads thread all diameters from ¼" to 6".

When writing for additional information, ask for Bulletin F-90.

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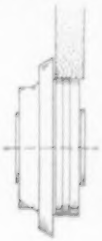
External and Internal Grinding In One Setup

A cost-cutting advantage of Landis 10" and 12" Type CH Universal Grinders.

LANDIS

precision grinders

External Diameter is Ground



Wheel Head Moves Back by Power

Rapid hydraulic positioning speeds wheel positioning . . . reduces operator fatigue.

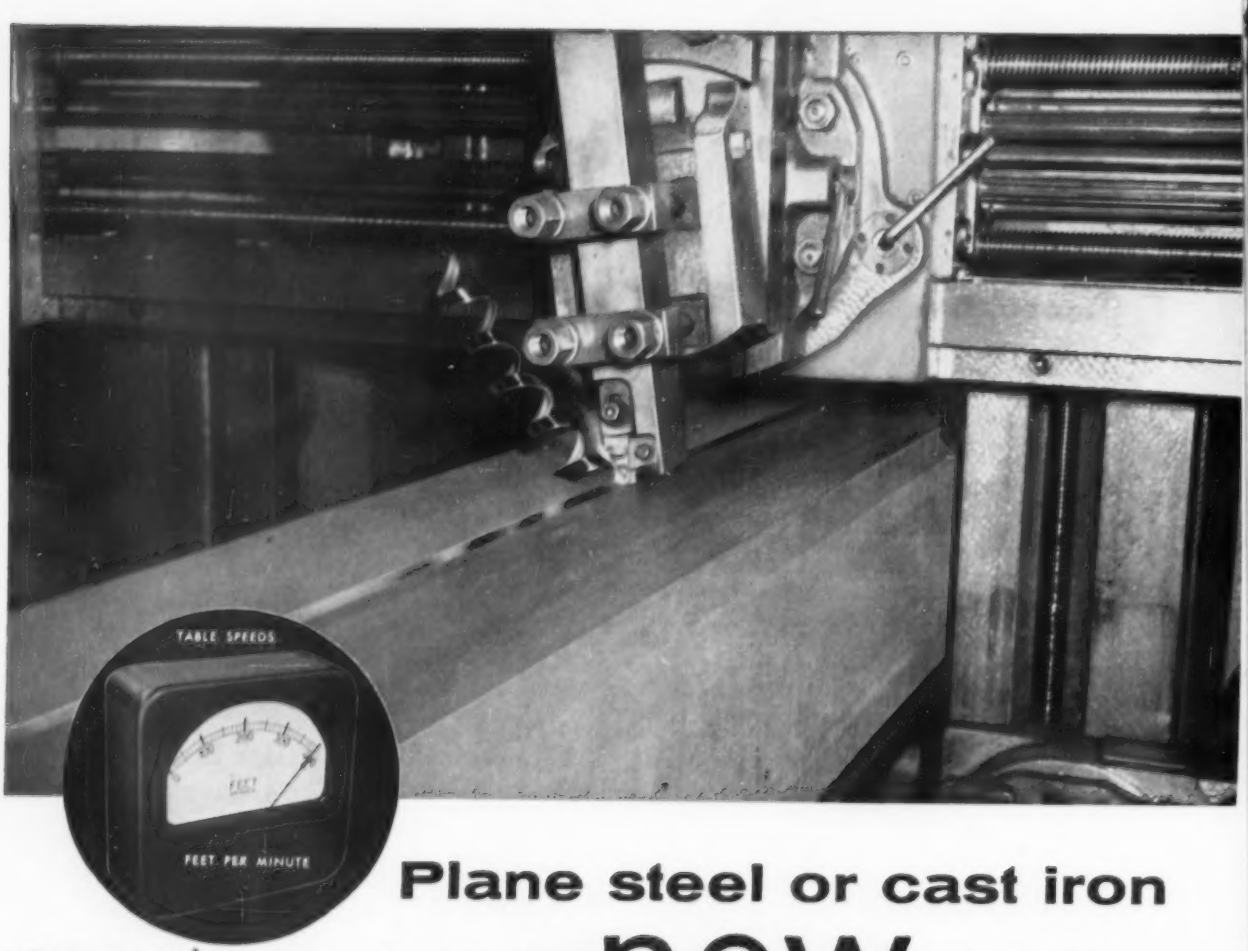
Internal Fixture Swings Down

Swinging bracket fixture lowered easily to grinding position . . . no belts to adjust.

Hole is Ground—Work Piece Finished!

LANDIS TOOL COMPANY

WAYNESBORO, PENNA.



Plane steel or cast iron Giddings & Lewis new Double

AT tool speed of 400 feet per minute, steel or cast iron chips literally "ZIP" off the workpiece. With speeds like this, you can double present-day production with Giddings & Lewis' new Hypro Double Housing Planers.

Now for the first time anywhere, G&L Hypro advanced-design planers offer table speeds ranging from 25 to 400 feet per minute . . . permitting you to take full advantage of the greater productivity of tungsten-carbide or other high-speed cutting tools. In addition, these machines have exceptional ability to maintain precise tolerances under the most severe cutting pressures.

Outstanding features of the machine include: dual saddle and slide controls; power cross-feed to side heads; extra-heavy cross-rail; electric rail clamp; twin-helical table drive gearing; extra-high pneumatic tool lifters on both rail and side heads; hydraulic table stops and jacks, and new design heavy box-section housings. You get 100% table support for added strength and machining accuracy, thanks to massive construction of the full double-length bed.

Giddings & Lewis adjustable voltage motor-generator set and the double-capacity table drive motor provide fast acceleration, deceleration and reversing — plus maximum power for short stroke planing operations.

For complete specifications and features, see your nearest G&L representative, or write direct to Giddings & Lewis Machine Tool Co., Fond du Lac, Wisconsin.

Literature Available:

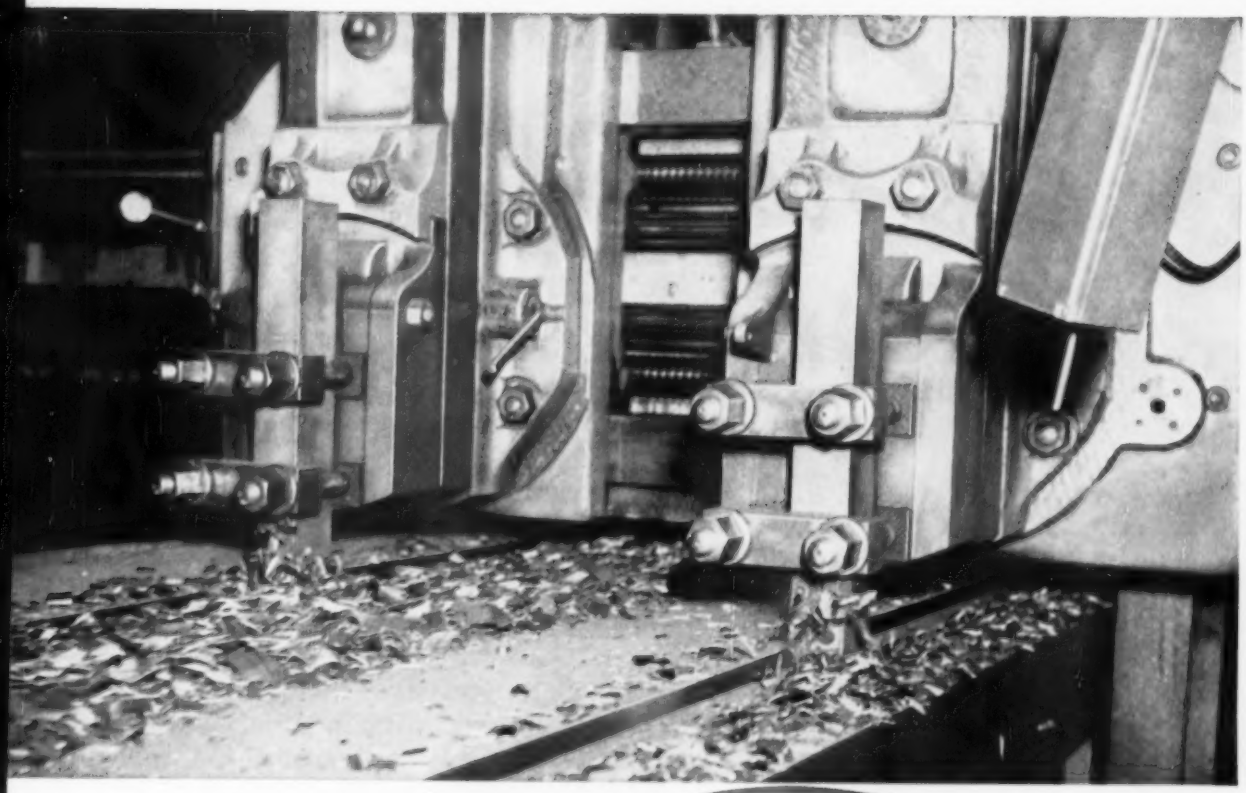
Ask for Bulletin No. 250 with details on new Hypro Double Housing Planers.

GIDDINGS & LEWIS MACHINE TOOL CO.

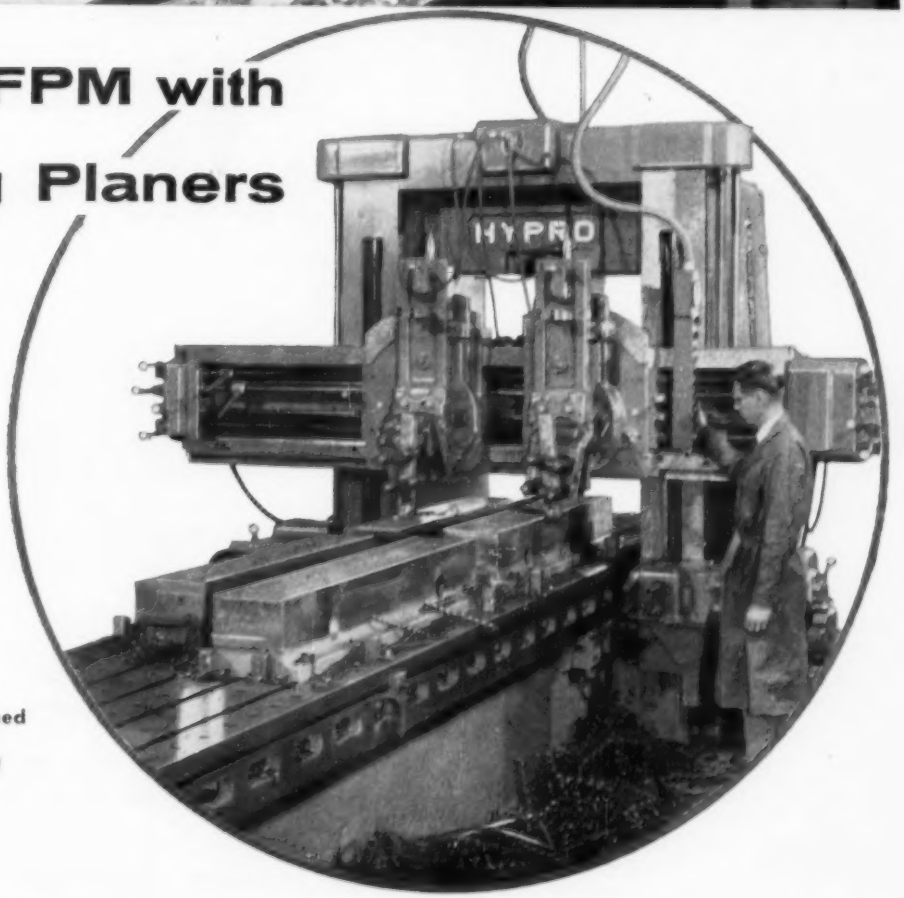
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Openside Planers, Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools.

G-56



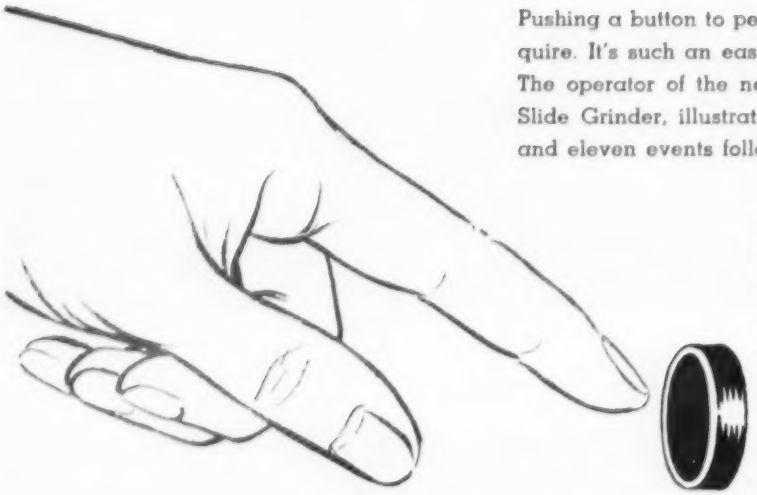
at 400 FPM with Housing Planers



Here's carbide planing of steel and cast iron at 400 feet per minute. Both rail heads are equipped with Davis Shear Angle Clamped-on carbide insert planer tools.

Just Push a

diameter and adjacent are ground



Pushing a button to perform useful work is a good habit to acquire. It's such an easy way to do a better job at lower cost. The operator of the new CINCINNATI FILMATIC Angular Wheel Slide Grinder, illustrated at the right, pushes a single button and eleven events follow automatically:

1) TABLE CLAMPED IN POSITION
2) WHEELHEAD RAPIDLY ADVANCES
3) GRINDING FLUID TURNED ON
4) WORK ROTATION STARTS
5) WORK GROUND AT "COARSE" FEED RATE
6) GRINDING FEED RATE CHANGES TO "FINE"
7) TARRY
8) WHEELHEAD RAPIDLY RETURNS
9) WORK ROTATION STOPS
10) GRINDING FLUID SHUT OFF
11) TABLE UNCLAMPED

FILMATIC

To support this fine semi-automatic performance (loading and unloading are manual) the machine is equipped with automatic grinding wheel balancing, an exclusive Cincinnati feature that promotes the finest finish and saves hours of time. Of course, the spindle is mounted on the famous CINCINNATI FILMATIC bearings, the bearings of perpetual youth. And three cost-reducing types of equipment are available as extras:

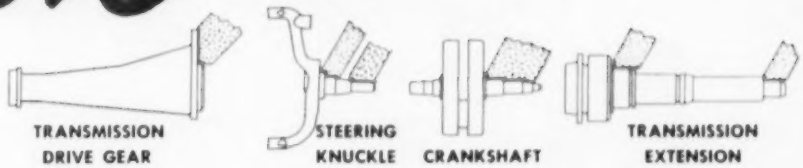
Automatic electric gage sizing with
automatic compensation for wheel wear
Behind-the-wheel profile truing
Simple, effective flagging

Would you like to know more about CINCINNATI FILMATIC Semi-Automatic Angular Wheel Slide Grinding Machines? Ask for catalog No. G-647.

CINCINNATI GRINDERS INCORPORATED **CINCINNATI 9, OHIO**

Button...

shoulder automatically



Push-button grinding saves operator effort and reduces cost. Four diameters, three radii and two shoulders are ground on steering knuckles at the rate of 96 per hour.

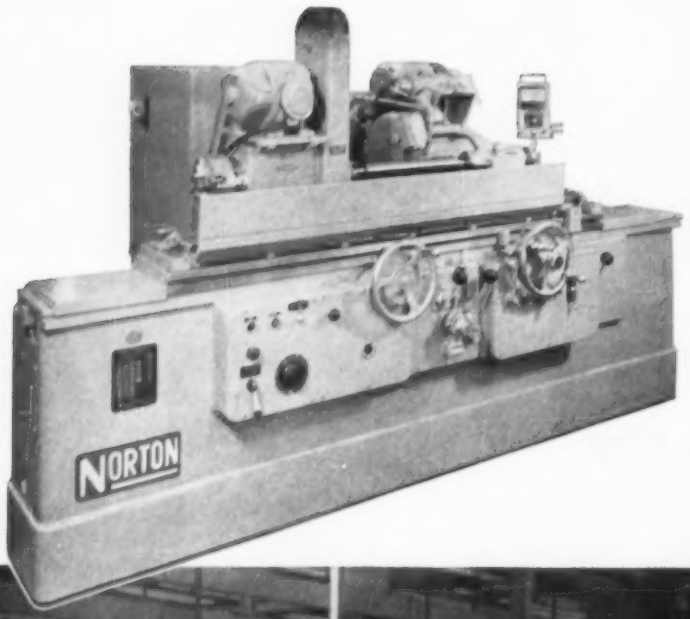
CINCINNATI FILMATIC
14" L x 36"
Semi-Automatic
Angular Wheel Slide
GRINDING MACHINE

CINCINNATI

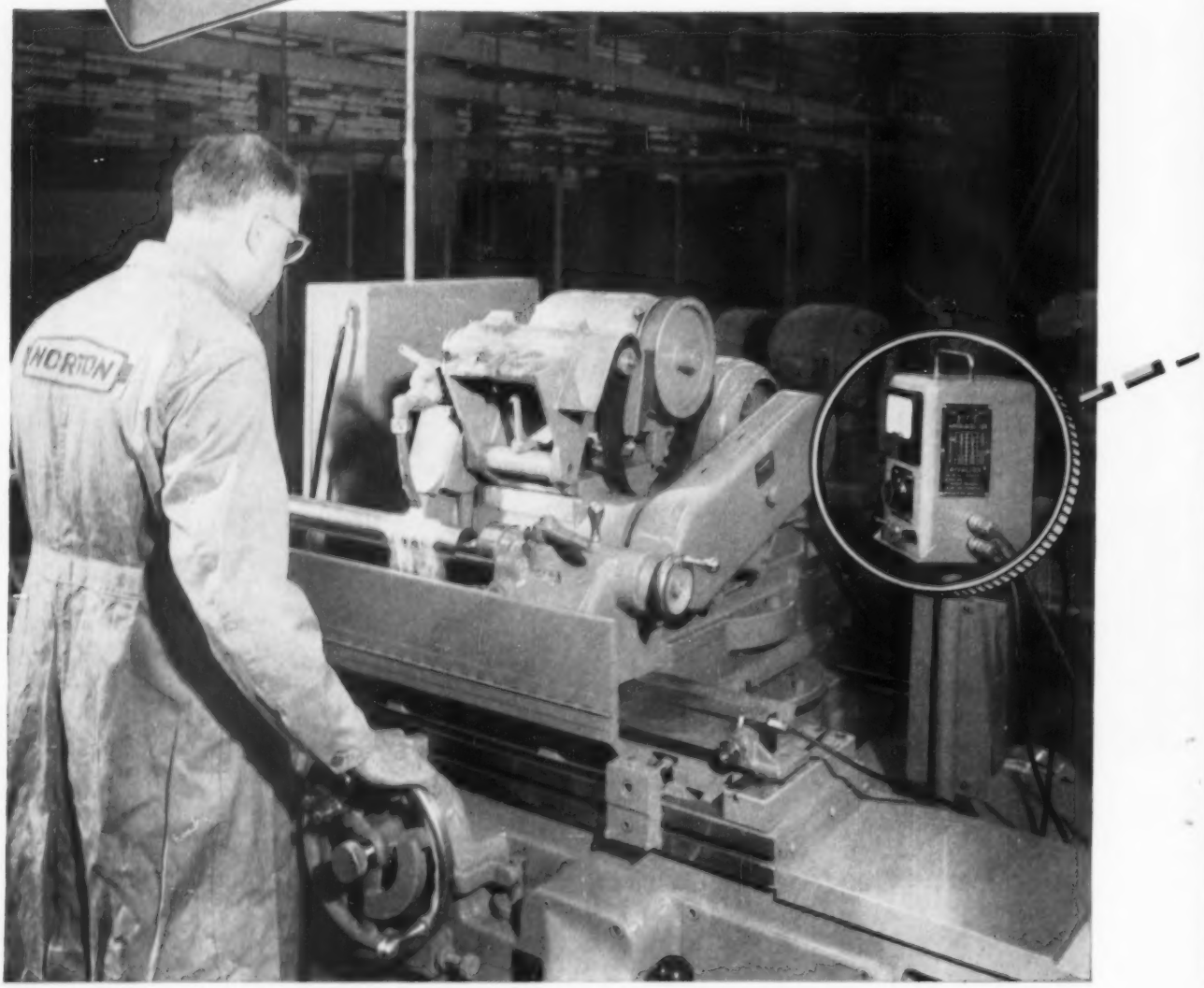
CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES • MICRO-CENTRIC GRINDING MACHINES

CINCINNATI

Now...



The New SWIVALIGN on a Norton 12" Type U-4 Universal Grinder. This latest Norton improvement adds to the speed and flexibility with which this popular grinder handles an almost endless variety of jobs.



Another Norton **"TOUCH of GOLD" Development** for faster, better, lower cost grinding. The SWIVALIGN Dual Electric Indicator, set up to measure swivel table adjustment on a Norton universal grinder. By eliminating the usual time-wasting cut-and-try adjustments and guesswork it saves grinding time and money.

New NORTON SWIVALIGN*

device eliminates cut-and-try in universal and cylindrical grinding

Dual electric indicator measures swivel table adjustment, saves time and work

Again Norton shows the way with a new device to simplify grinding operations and cut production costs.

The SWIVALIGN, available for Norton universal and cylindrical grinders, enables operators to adjust the angular positions of swivel tables quickly and accurately, eliminating the cut-and-try procedure normally required.

The SWIVALIGN consists essentially of an electric pick-up unit with a zero adjuster at each end of the swivel table, and a two-channel amplifier with a pair of indicating needles reading on a common scale. Each needle responds to movement of one of the pick-up elements. Both needles move in the same direction of rotation as the swivel table.

Divisions on the meter scale indicate taper changes in thousandths of an inch per foot of taper. Two ranges of readings are provided — one for extremely accurate settings with graduations of .0001" per foot and the other of .0005" per foot of taper change. The desired range is obtained by a convenient selector switch.

Simple, accurate operation

When the error in taper has been determined, the pick-up adjusting screws are used to set the two needles on the instrument to the required taper correction. The swivel adjustment on the table is then made to move the table until both needles meet at zero on the meter scale.

One particular SWIVALIGN advantage is that each end of the table registers its own movement. If one needle fails to move, or lags behind the other, it indicates the table is deflected and the work centers out of alignment — which condition should be corrected. Furthermore, since the corrections made are based on the positions of the needles which register taper per foot, the position of the work in relation to the swivel pivot does not affect the operation of the device.

For further facts

on the new Norton SWIVALIGN, and on its application to Norton universal and cylindrical grinders, see your Norton Representative, or write direct. And remember: only Norton offers you such long experience in both grinding machines and wheels to bring you the "Touch of Gold" that helps you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Mass. *In Canada:* J. H. Ryder Machinery Co., Ltd., Toronto 5.

* ***SWIVALIGN***—*Norton* trade name for Dual Electric Indicator for accurate measurement of swivel table adjustment.

To Economize, Modernize with NEW

NORTON

GRINDERS and LAPPERS

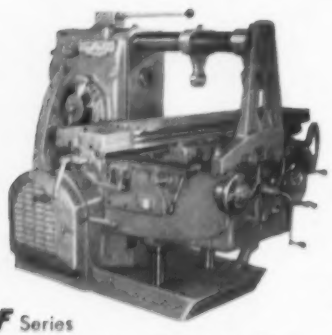
Making better products...
to make your products better

District Sales Offices:

Worcester • Hartford • New York Area, Teterboro, New Jersey • Cleveland • Chicago • Detroit

New Kearney & Trecker's

Controls on new TF Series milling machines are conveniently grouped up-front where they belong — to speed production . . . assure accurate settings . . . reduce operator fatigue



Available under Tool-Lease program

TF Series
Model 210 Plain Milling Machine

POWER — 10hp spindle drive; 3hp feed and rapid traverse drive
TABLE WORKING SURFACE — 62" x 14"
FEEDS — (32) ⅝ to 90 ipm
SPEEDS — (24) 15 to 1500 rpm
WEIGHT — 9200 lbs.

ONE look tells why the new TF Series milling machines — Plain, Universal and Vertical — are so easy to operate. "Bull's-eye" up-front control grouping permits operators to achieve exact settings faster, more adeptly and with greater ease than ever before. This "Fron-Trol" convenience is the key to low-cost production . . . because it increases the operator's efficiency and measurably reduces fatigue through elimination of wasted steps.

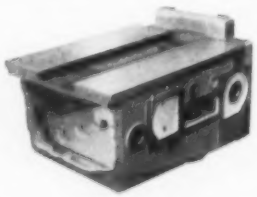
The "bull's-eye" knee and saddle-mounted controls are safety-interlocked and include feed selection, directional Mono-Lever table feed and rapid traverse, automatic cycle table feed and rapid traverse controls, front-mounted table handwheel, saddle clamping gib and backlash eliminator, and hand and power directional controls for knee and saddle movements.

In addition, the new TF's give you a superior combination of outstanding design and operating features never before available on any other knee-type milling machines. They're built in five sizes — No. 2 to No. 6 from 10hp to 50hp.

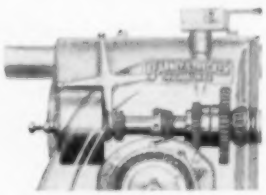
Why take less than the latest when you want new milling machines? You can get all the facts on new TF Series machines from your Kearney & Trecker representative—call him or mail the coupon to factory today!

A few more of many reasons why TF Series milling machines are so easy to operate

Twin Screw Knee Support — Exclusive double-support arrangement most effectively distributes weight of the new machines' much larger, wider, heavier knee, saddle and table. This balanced design substantially increases stability under heaviest loads . . . offers greater resistance to torsional thrust under all cuts . . . halves the wear factor, assuring greater, longer-lasting accuracy.



Heavier, Wider, One-Piece Knee — The Twin-Screw arrangement supports the heavier, larger knee. Span and length of ways is increased considerably, providing fuller saddle support . . . longer-lasting accuracy.



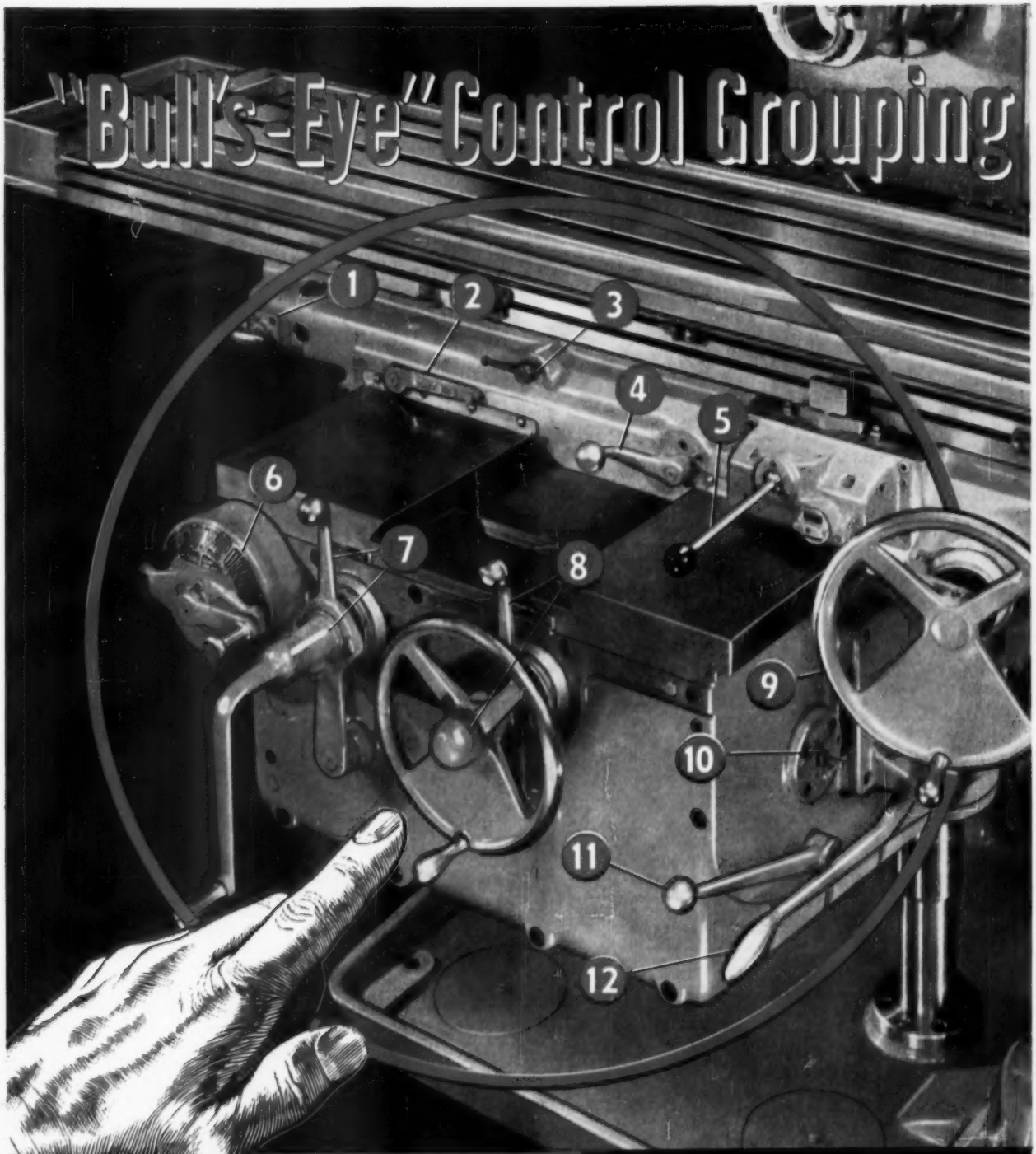
Three-Bearing Spindle — Complete assembly consists of three heavy-duty bearings, flywheel, train of wide-faced forged steel gears. Rigidity of spindle unit contributes to increased cutter life and quieter operation.

KEARNEY & TRECKER CORP.
6786 W. National Avenue, Milwaukee 14, Wisconsin

Please send me Catalog No. TF-50 with details on the new line of TF Series Plain, Universal and Vertical milling machines.

Name .....
Title .....
Company .....
Address .....
City ..... Zone ..... State .....

Massive Column — Solid back, double-box section column is scientifically ribbed throughout to rigidly withstand heaviest cutting forces. Full bearing column face affords maximum support for the knee. Cross-mounted motor assures maximum ventilation, and permits easy access for routine maintenance.



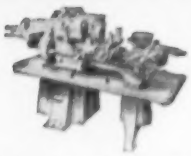
FRONT-MOUNTED CONTROLS

1 — Single shot saddle-table and mechanism way lubricator
2 — Backlash eliminator
3 — Table clamp
4 — Adjustable saddle clamping gib
5 — Mono-Lever and Automatic Cycle Table Control
6 — Quick change feed selector
7 — Hand and power knee controls
8 — Hand and power saddle controls
9 — Front-mounted table handwheel
10 — Knee lubrication filter
11 — Spindle "start-stop"
12 — Rapid traverse control — knee, table and saddle.

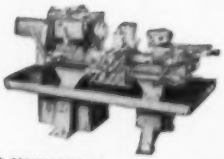
KEARNEY & TRECKER
MILWAUKEE

BUILDERS OF PRECISION AND PRODUCTION MACHINE TOOLS SINCE 1898

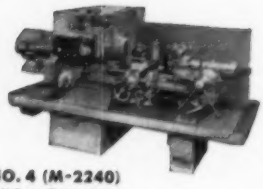
RAM TYPE TURRET LATHES



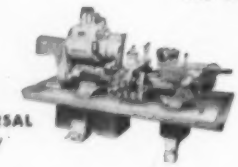
NO. 2 ALL-GEARED HEAD
1" Bar Capacity
14" Swing



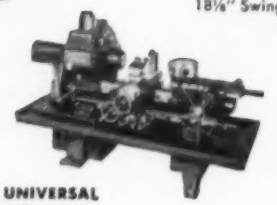
NO. 3 UNIVERSAL
1½" Bar Capacity
15⅜" Swing



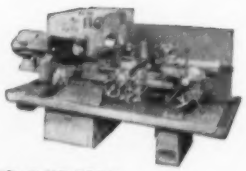
NO. 4 (M-2240)
2" Bar Capacity
18⅛" Swing



NO. 4 UNIVERSAL
2" Bar Capacity
18⅛" Swing



NO. 5 UNIVERSAL
2½" Bar Capacity
20" Swing



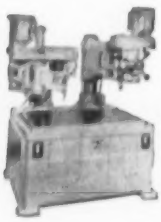
NO. 5 (M-2250)
2½" Bar Capacity
20" Swing

PRECISION TAPPING AND THREADING MACHINES

NO. 10
TAPPING MACHINE
0-80 to 10-24 Capacity

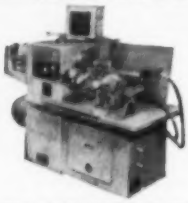
NO. 11
TAPPING MACHINE
8-36 to ⅞" Capacity

NO. 12
TAPPING MACHINE
⅜" to 2½" Capacity

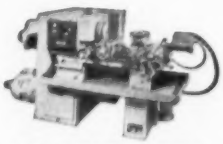


NO. 11
RS RADIAL
(Single Head)
NO. 11
RD RADIAL
(Double Head)
8-36 to ⅞" Capacity

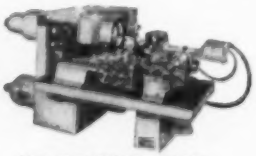
ELECTRO-CYCLES®



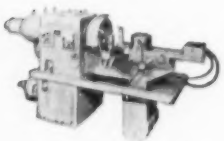
NO. 1 ELECTRO-CYCLE
⅛" Bar Capacity
11" Swing



NO. 2 ELECTRO-CYCLE
1" Bar Capacity
14" Swing

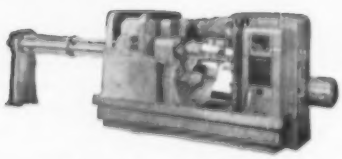


NO. 3 ELECTRO-CYCLE
1½" Bar Capacity
15⅜" Swing



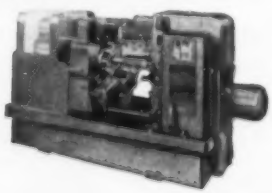
16" ELECTRO-CYCLE
1½" Bar Capacity
16⅞" Swing

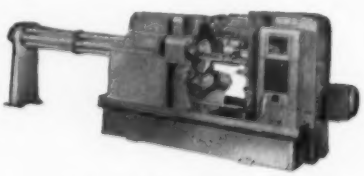
MULTI-SPINDLE AUTOMATICS



5-SPINDLE BAR MACHINE
1¾" Standard Bar Capacity
2¼" Oversize Capacity

5-SPINDLE CHUCKING MACHINE
6" Swing

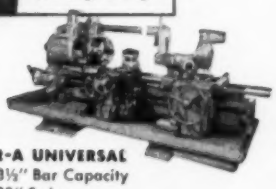




6-SPINDLE BAR MACHINE
¾" or 1¼" Bar Capacity

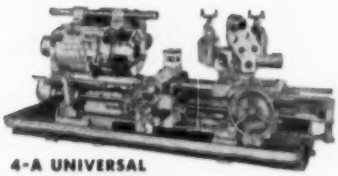
SADDLE TYPE TURRET LATHES — Heavy Duty

1-A UNIVERSAL
2½" or 3" Bar Capacity
16¼" Swing



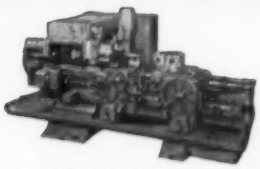
2-A UNIVERSAL
3½" Bar Capacity
20" Swing

3-A UNIVERSAL
4½" or 6" Bar Capacity
23½" Swing

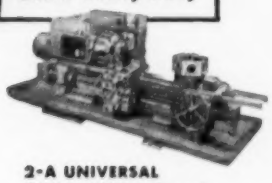


4-A UNIVERSAL
8", 9" or 12" Bar Capacity
28¼" Swing

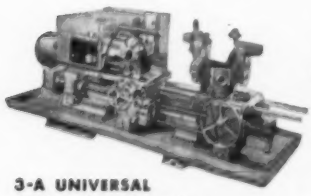
SADDLE TYPE TURRET LATHES — Extra Heavy Duty



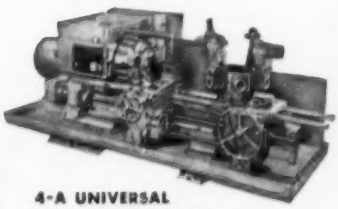
1-A UNIVERSAL
2½" or 3" Bar Capacity
16¼" Swing



2-A UNIVERSAL
3½" or 4½" Bar Capacity
20" Swing

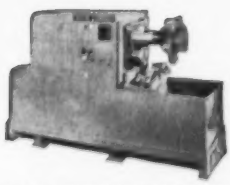


3-A UNIVERSAL
4½" or 6" Bar Capacity
23½" Swing

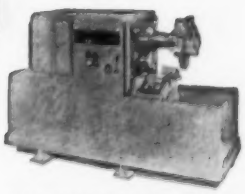


4-A UNIVERSAL
9" or 12" Bar Capacity
28¼" Swing

SINGLE SPINDLE AUTOMATICS



1 AC CHUCKING MACHINE
8" or 10" Chuck—
6" Working Stroke



2 AC CHUCKING MACHINE
10" or 12" Chuck—
9" Working Stroke

You get more than just a high precision machine

WHEN YOU BUY A WARNER & SWASEY

You buy a machine that is individually designed for your type and range of work . . . designed by a company that has created many design "firsts", one that is ready to help you with any special tool engineering problems. A complete record of your Warner & Swasey is kept in our plant . . . with service parts quickly available . . . with a nation-wide, factory-trained service staff always at your service. The industry's widest range of authoritative technical literature is also available for use in your plant. On Warner & Swasey's demonstration floor you can even see your model in action before you buy. But most important to you, when you buy a Warner & Swasey you're buying a machine backed by a 75-year record of dependable, high-precision service in plants throughout the world!

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

You can produce it better, faster, for less . . . with a Warner & Swasey

MEET
THE MOST COMPLETE CUTTING TOOL LINE
MORSE CARBON TOOLS

"MR. MORSE"

. . . the biggest and fastest all-around man in the cutting tool industry . . . your Morse-Franchised Distributor

He's got the most complete line . . . the right cutting tools for every operation from the automated production lines of the biggest mass manufacturers, to the smallest job shop.

Carbon . . . high speed . . . tungsten carbide, tipped or solid . . . you name it and he's got it . . . *right now, when you want it! He can recommend the right tool for any job,* regardless of tool requirements. That's why Morse means "The Most" in Cutting Tools . . . because your Morse-Franchised Distributor can do *the most* for you . . . any time you call on him. So call on him today for any current requirements.

MORSE means "THE MOST" in Cutting Tools

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS

Subsidiary of VAN NORMAN INDUSTRIES, INC.

Warehouses in New York, Chicago, Detroit, Dallas, San Francisco

Buy them by phone from your Morse-Franchised Distributor and save ordering time

break through those **PRODUCTION**

with **LAPOINTE**

electro-motive drive

Deliveries to your own customers are guaranteed when you speed up production by LAPOINTE BROACHING . . . on one of the truly modern machines in the Lapointe line, built with the amazing electro-motive drive.

And not only is your production up, but your quality is up, too. With these powerful, massive machines you get chatterless broaching — fine finish to extremely close tolerances.

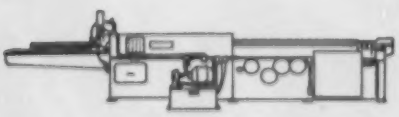
If you are machining parts involving repetitive operations — especially if the design is intricate — you should investigate the possibilities of Lapointe Broaching. . . . Our Broaching Machines are designed to meet the demands of today's mass production and automation processes. Our pioneering effort and extensive background in this field is available to you.

THE LAPOINTE MACHINE TOOL COMPANY

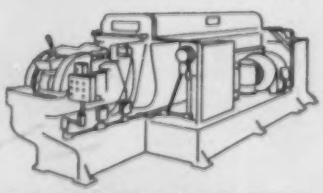
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

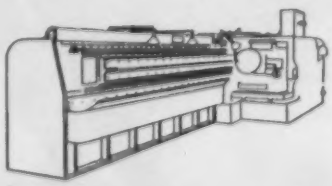
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC



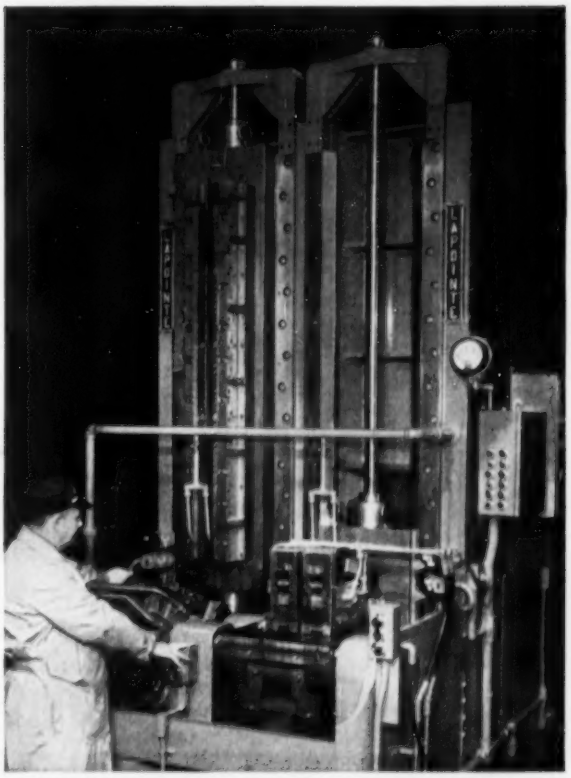
SRHE SINGLE RAM HORIZONTAL, ELECTRIC

BOTTLENECKS

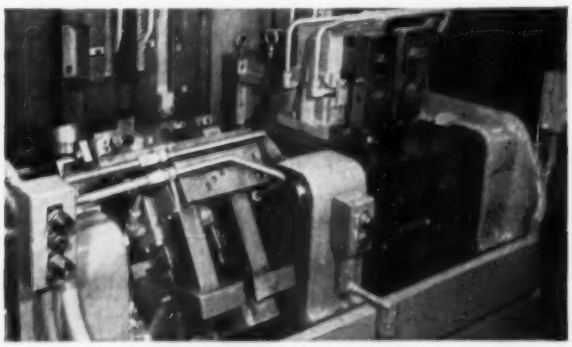
BROACHING MACHINES

LAPOINTE

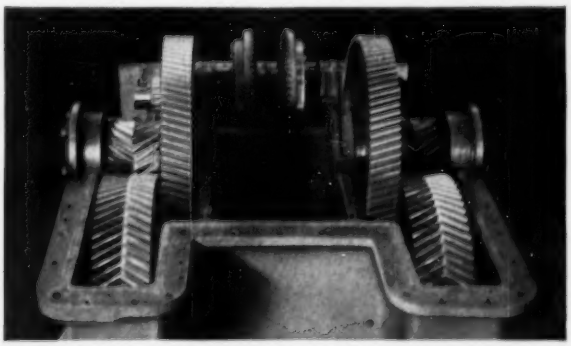
takes all the responsibility for your BROACHING program — we build the broaching **machines**, build the broaching **fixtures**, and make the **broaches!**



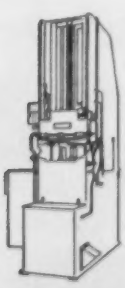
DOUBLE RAM VERTICAL, ELECTRO-MOTIVE DRIVE, LAPOINTE BROACHING MACHINE 40 hp. 70-inch Stroke, equipped with Lapointe-built Fixtures and Lapointe Broaches.



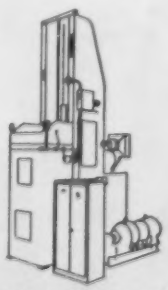
THE EFFICIENT, SAFE TIP-DOWN FIXTURES used on this machine for broaching an automotive front suspension arm are patented . . . and exclusive with Lapointe.



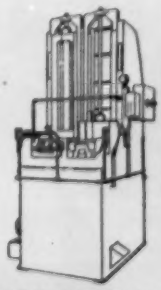
TRAIN OF HEAVY GEARS, for driving the broaches on the 40 hp., 70-inch Stroke, Double Ram Vertical Electromotive Drive Lapointe Broaching Machine.



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



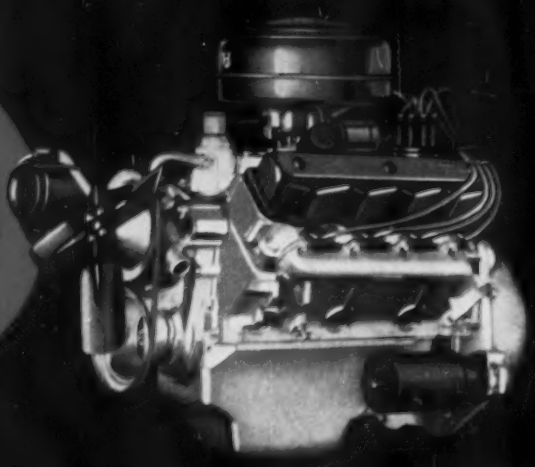
DRVE DOUBLE RAM VERTICAL, ELECTRIC

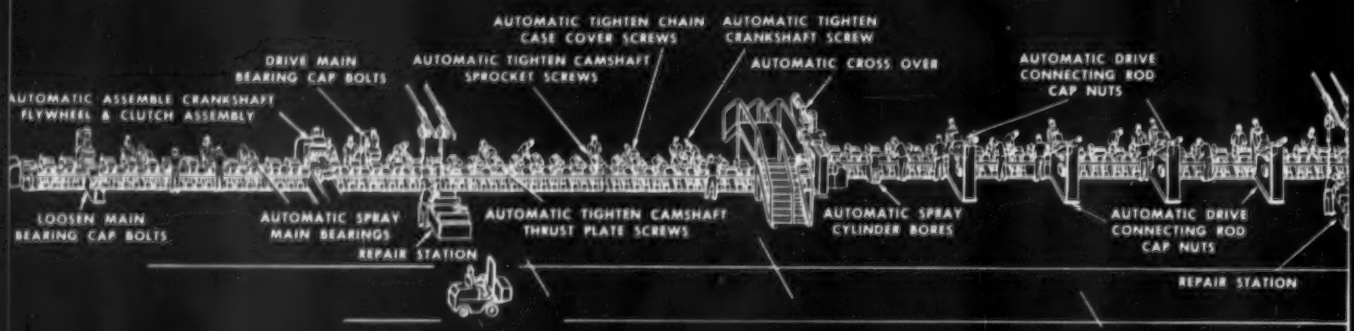
LAPOINTE

BROACHING MACHINES

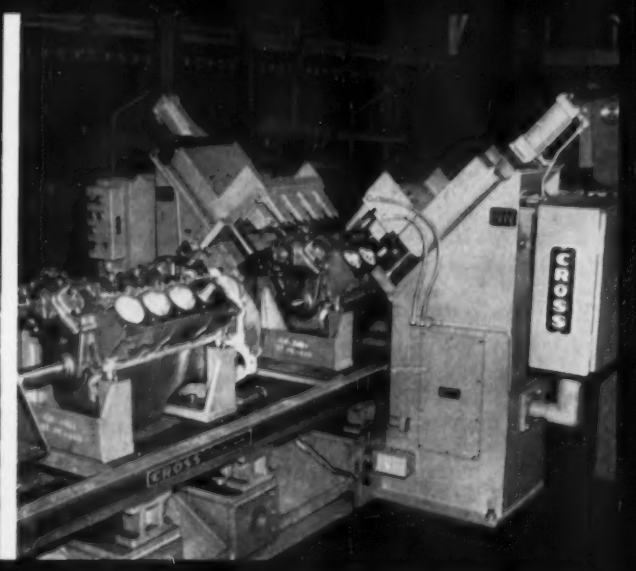
Another Automation First by Cross

Automation for Car Engine Assembly!



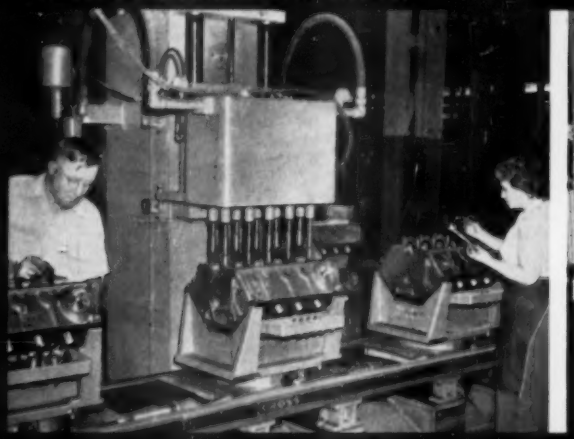

AUTOMATIC ASSEMBLE CRANKSHAFT FLYWHEEL & CLUTCH ASSEMBLY
DRIVE MAIN BEARING CAP BOLTS
AUTOMATIC TIGHTEN CAMSHAFT SPROCKET SCREWS
AUTOMATIC TIGHTEN CHAIN CASE COVER SCREWS
AUTOMATIC TIGHTEN CRANKSHAFT SCREW
AUTOMATIC CROSS OVER
AUTOMATIC DRIVE CONNECTING ROD CAP NUTS
LOOSEN MAIN BEARING CAP BOLTS
AUTOMATIC SPRAY MAIN BEARINGS
REPAIR STATION
AUTOMATIC TIGHTEN CAMSHAFT THRUST PLATE SCREWS
AUTOMATIC SPRAY CYLINDER BORES
AUTOMATIC DRIVE CONNECTING ROD CAP NUTS
REPAIR STATION

Section II, Station 44: engine is transferred to Section III, Station 1, and placed in car position.

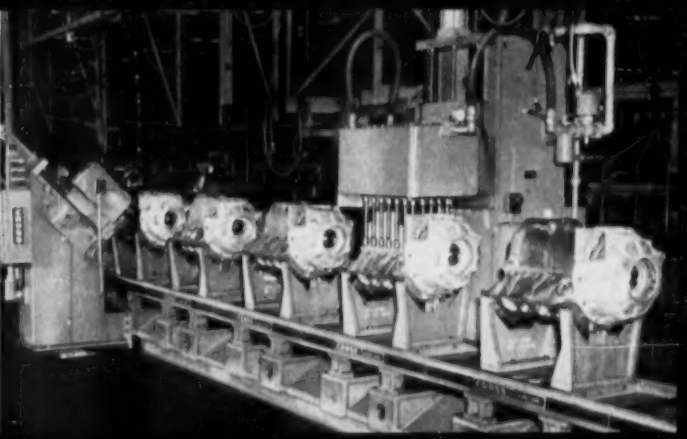


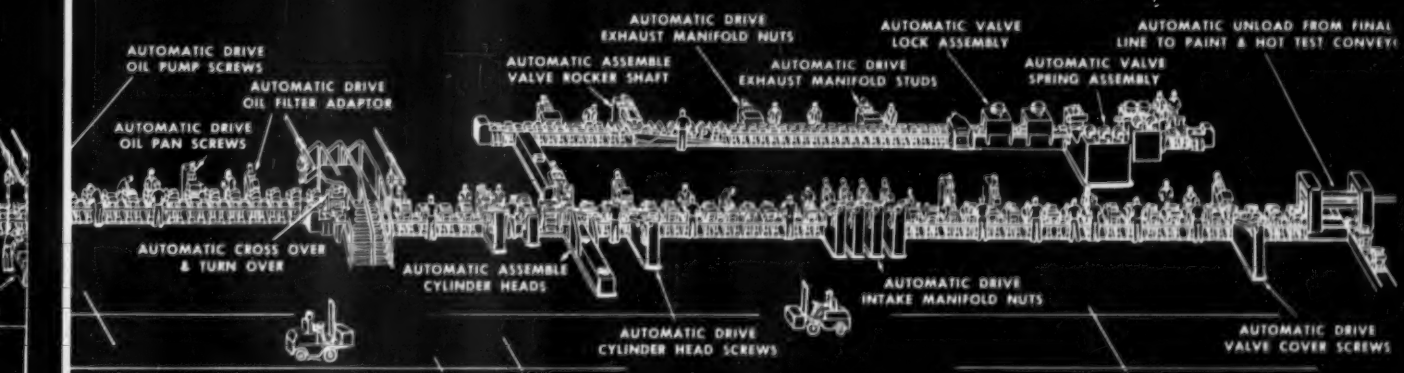
Section III, Station 3: oil is automatically applied to cylinders and valve lifter holes.

Section I, Station 3: bearing cap bolts are automatically loosened ready for crankshaft assembly.



Section II, Station 37: pan screws are automatically tightened, Station 40: oil filter adapter is assembled.




AUTOMATIC DRIVE OIL PUMP SCREWS
AUTOMATIC DRIVE OIL FILTER ADAPTOR
AUTOMATIC DRIVE OIL PAN SCREWS
AUTOMATIC CROSS OVER & TURN OVER
AUTOMATIC ASSEMBLE CYLINDER HEADS
AUTOMATIC DRIVE CYLINDER HEAD SCREWS
AUTOMATIC ASSEMBLE VALVE ROCKER SHAFT
AUTOMATIC DRIVE EXHAUST MANIFOLD NUTS
AUTOMATIC DRIVE EXHAUST MANIFOLD STUDS
AUTOMATIC DRIVE INTAKE MANIFOLD NUTS
AUTOMATIC VALVE LOCK ASSEMBLY
AUTOMATIC VALVE SPRING ASSEMBLY
AUTOMATIC UNLOAD FROM FINAL LINE TO PAINT & HOT TEST CONVEYO
AUTOMATIC DRIVE VALVE COVER SCREWS

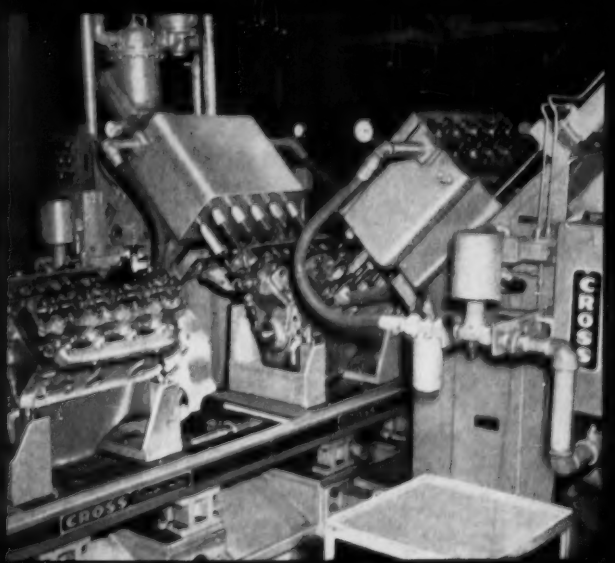
This production line for assembling V-8 car engines consists of three Transfer-matics with a total length of 812 feet. One assembles the engine; the other two (only one shown) assemble the cylinder heads. Operations start at three points with the block and head castings. They are automatically transferred through 198 stations as parts and sub-assemblies are added until the engine is completed and ready for testing.

The rated capacity is 150 engines per hour.

The engine assembly Transfer-matic is sectionized, a feature originated by Cross to reduce downtime. Three sections are provided to permit stopping some operations without interrupting the others.

Modular unit construction provides flexibility for engine changes and for adding new automatic assembly devices of the future.

Like other Cross machines, all parts—even tooling details—are made to interchangeable tolerances for fast, easy maintenance. Other features include construction to JIC standards and automatic lubrication.



Section III, Station 15: cylinder head bolts are tightened to a pre-determined torque.

Established 1898

THE CROSS CO.

First in Automation

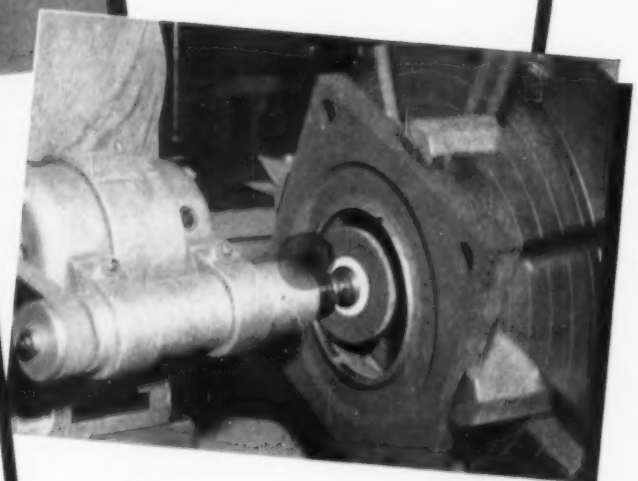
DETROIT 7, MICHIGAN

The INSIDE STORY of INTERNAL GRINDING by NORTON

How Norton wheels for internal grinding step up your product quality and profits with the **"TOUCH of GOLD"**

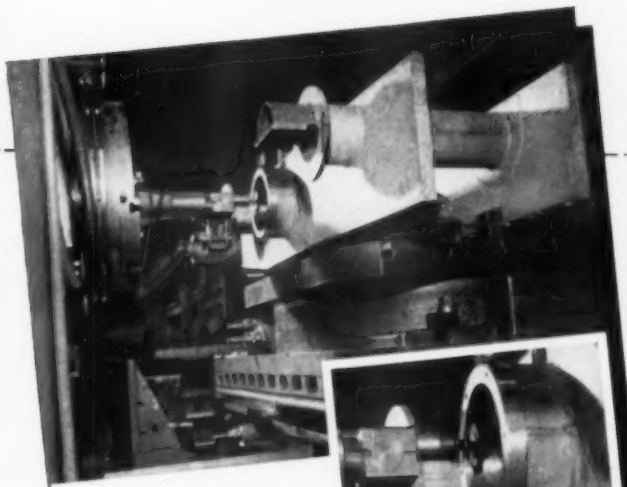
They're Precision-Processed

Norton wheels for internal grinding are built by exclusive precision-processing that results in absolutely uniform grinding action, in wheel after wheel of the same specifications. This means you can depend on each Norton wheel of the same specifications for exactly the same grinding action. No fussing with timing cycles when you change wheels — you save on every grinding job. Other typical "Touch of Gold" advantages include their fast, free, cool-cutting action and extra long life. Norton wheels are made in types, sizes, bonds and abrasives for every internal grinding application.



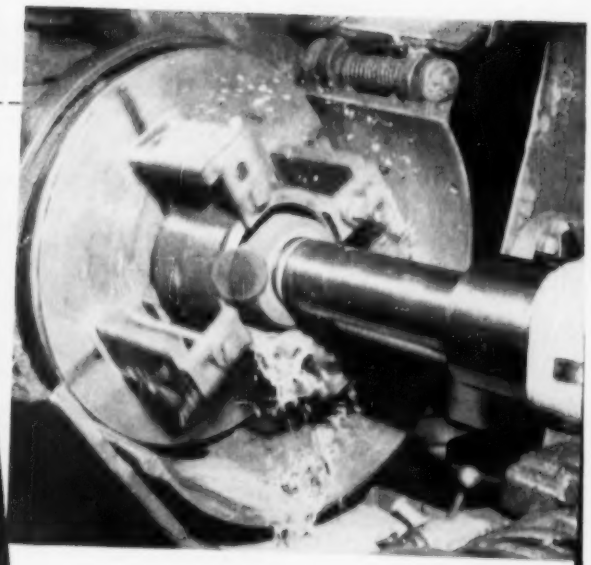
The Famous Norton G Bond

The Norton G Bond is the most efficient vitrified bond ever developed for precision and semi-precision grinding. Holding each abrasive grain just long enough for maximum cutting action, it assures a constant grinding surface of fresh, sharp cutting edges. As a result, G Bond wheels cut cooler and faster . . . produce smoother finishes . . . dress easier and give more pieces per dressing. With Norton 32 ALUNDUM* abrasive — outstanding for heavy feeds and rapid stock removal — it makes an ideal "Touch of Gold" combination for your grinding jobs on steel and steel alloys.



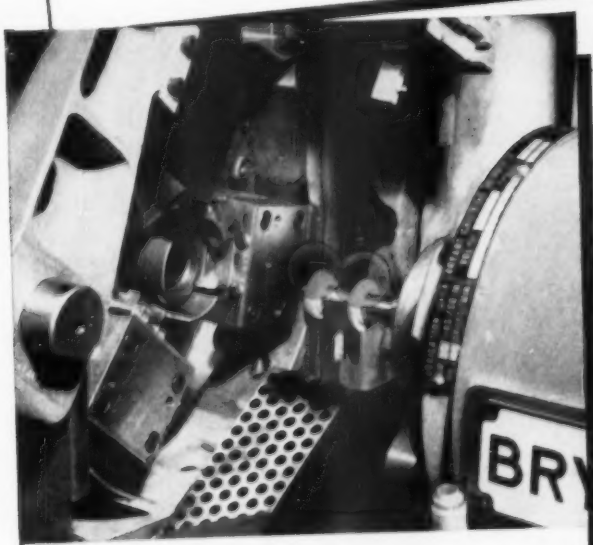
An Unusual Set-Up

Grinding bearing housings with a Norton wheel on a Dumore tool post grinder, mounted on a horizontal boring mill. The grinder itself revolves in a planetary motion, the grinding wheel spindle following the I.D. of the hole. To grind the other end of the housing the work table is turned 180°. *Material:* cast steel. *I.D.:* 7.8737". *Stock removal:* .005" each end. *Limits:* +.0001", −.0004". *Time:* two hours each end



Rounding It Out—Fast

During hardening, a certain amount of warpage occurs in this steel mould band. A Norton wheel is grinding it perfectly round and smooth. The band has an I.D. of 6" and is 4" deep. Average amount of stock removal is .040" and the time cycle is 30 minutes.



Precision Performance—Doubled

Here a Norton two-wheel set-up is ready to go into fast grinding action. The job is grinding a double race in a steering gear bearing. *Material:* SAE 1045 steel, 54 Rockwell C. *I.D.:* 1.1507". *Stock removal:* .012". *Limits:* +.0000", −.0005". *Finish:* 10 microinches RMS.

See Your Norton Distributor

for further facts on how Norton wheels can bring the value-adding, money-saving "Touch of Gold" to your own internal grinding operations. He'll be glad to arrange a test in your plant. Or write direct to your nearest Norton district office. And remember: only Norton offers you such long experience in both grinding wheels and grinding machines. NORTON COMPANY, Worcester 6, Mass. Offices in nine cities. Distributors in all industrial areas — listed under "Grinding Wheels" in your phone directory, yellow pages. Behr-Manning, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated.

NORTON

ABRASIVES

Making better products... to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels
Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives
Sharpening Stones • Pressure-Sensitive Tapes

W-1683

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

HARDINGE
ELMIRA, N.Y.

High Speed Precision
MILLING MACHINES

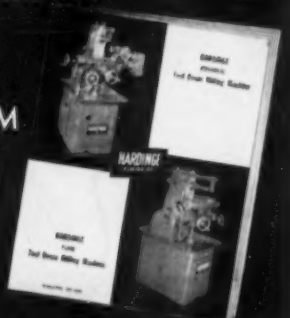
The RIGHT Size For Work Which is
Too Small for Heavy Duty Millers.

Advantages

- Saves Production Time
- Higher Speeds
- Lower Power Consumption
- Less Investment
- Saves Floor Space

1 1/16" Cutter Spindle Capacity with 5C Round Hardinge Collet
Eight Spindle Speeds — 110 to 1850 R.P.M.

Write for Bulletin TM-UM



Model UM Universal Spiral Miller
Model TM Universal Plain Miller

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

See **HARDINGE MACHINES IN ACTION** – *SPACE 452 – CHICAGO – A.S.T.E. SHOW*

This WHITE wheel's the RIGHT wheel!

PHOTOGRAPHED AT COLE CARBIDE INDUSTRIES, ROYAL OAK, MICH.

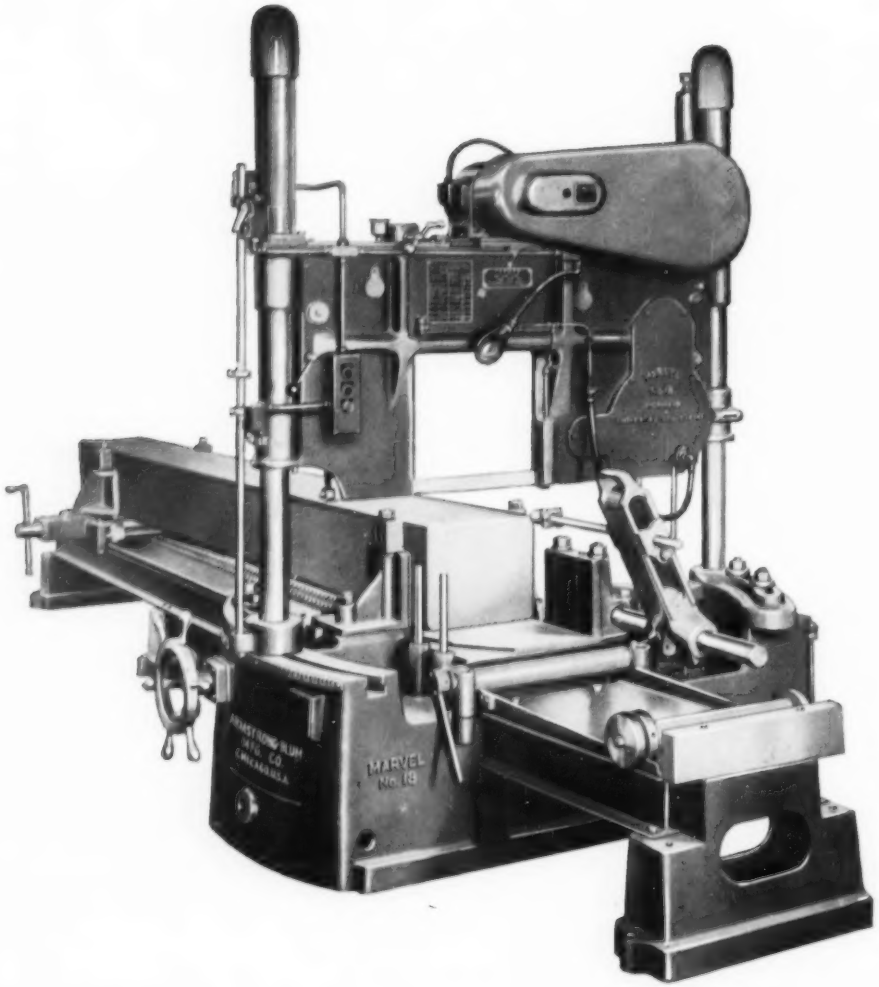
If you're after greater precision, production and economy in your tool room grinding, change to "V40" Bond Wheels by CARBORUNDUM. The sharp, white aluminum oxide grain cuts exceptionally free and cool, even on high speed tool steels. You can take heavier infeeds without burning the work...and still get a better finish. The stronger vitrified bond makes "V40" wheels last longer, without costly downtime for dressing midway through a job. "V40" wheels come in the *right* types, sizes and gradings for *every* tool room job. Call your CARBORUNDUM Distributor or salesman for a free demonstration in your shop. For your copy of Bulletin A-1310, giving actual "V40" case histories and recommended gradings, write The Carborundum Company, Niagara Falls, New York. In Canada: Canadian Carborundum Company, Ltd., Niagara Falls, Ont.

Through application "know-how" and product quality

CARBORUNDUM

REGISTERED TRADE MARK

continually puts more sense in your abrasive dollar



No Job too big or too tough . . .

for MARVEL "*Giant*" Hack Saws

These giant MARVEL Hydraulic Hack Saws (No. 18, Capacity 18" x 18"; and No. 24, Capacity 24" x 24") were *basically* designed for rapid and economical cut-off of BIG WORK. They are not merely "conventional" designs "stretched" to big capacity. They are truly designed and built with the ruggedness and rigidity necessary to withstand the rough treatment of sawing big work, even though the work is in the "toughest of the tough" alloys.

They are reliably fulfilling the cut-off requirements in innumerable steel mills, forge shops, structural shops, warehouses, and machine shops, with assured low tool cost and minimum kerf loss of steel.

In addition to cutting-off, they are reducing costs by eliminating further machining operations. Heat treated die blocks are being reclaimed for re-sinking by sawing off the worn face; columns, beams, pipe, and tubing are being sawed to *finished*, square ends, eliminating milling; angular sawing is done conveniently by swinging the upper structure on the base, to any angle up to 45 degrees—*without moving the work*.

Contemplating the modern trend toward ever tougher steels and larger sizes, these are the logical sawing machines to buy, not only for today's needs but for tomorrow's as well.

Write for Catalog

MARVEL *Metal Cutting* SAWS
Better Machines—Better Blades

ARMSTRONG-BLUM MFG. CO. 5700 West Bloomingdale Avenue • Chicago 39, U.S.A.

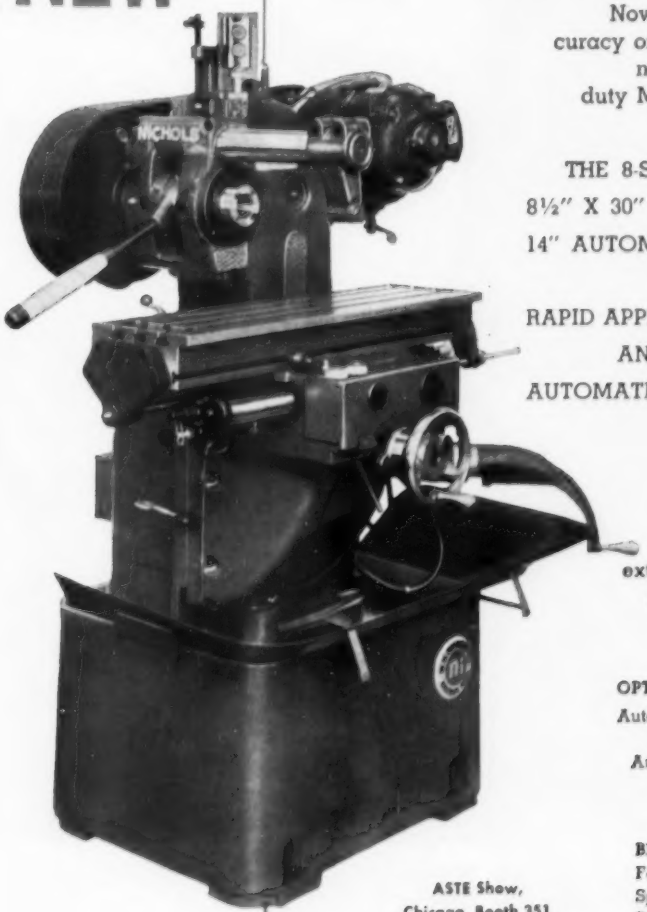
"Anything almost right is wrong"

W. H. NICHOLS
1873 1951

NEW NICHOLS

Semi-Automatic Miller

Now Nichols matches the unequalled accuracy of its famous hand-miller in the new semi-automatic heavy duty Miller #8-SA.



THE 8-SA MILLER BY NICHOLS PROVIDES
8½" X 30" TABLE WITH 3 T-SLOTS
14" AUTOMATIC PNEUMATIC LONGITUDINAL TABLE FEED WITH
RAPID APPROACH, SLOW CUTTING FEED, AND RAPID RETURN . . .
AUTOMATIC TABLE WAY LUBRICATION.

The Nichols 8-SA is a production miller with vertical and transverse table screw feed featuring a **heavier knee** and **extra wide saddle** for greater bearing surface . . . air equipment **inside** the saddle saves space.

OPTIONAL:

Automatic Pneumatic Down Feed To Spindle Head
Automatic Pneumatic Transverse Table Feed
Automatic Milling Cycle through synchronization of any two pneumatic feeds.

BRIEF SPECIFICATIONS: • Table 8½" x 30" Feed 0-60" min. • Rapid traverse 300" min. Spindle speeds available up to 5000 rpm.
Range: Longitudinal table feed 14"
Transverse table travel 6"
Vertical travel of knee 11"
Rise and fall of spindle head 4½"

ASTE Show,
Chicago, Booth 351

Write for catalog on the Nichols way to increase production and lower costs. Reservation may be made for sound, color film, "The Miller That Uses Its Head".

W. H. NICHOLS COMPANY
WALTHAM 54, MASS.

National Distributors
NICHOLS-MORRIS CORPORATION • 76F Mamaroneck Ave., White Plains, N.Y.

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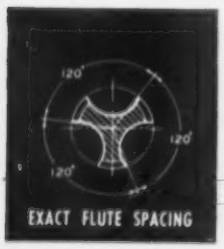
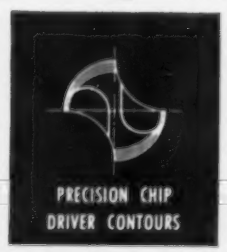
Taps with Balanced Action— give you the latest mechanical and technical advances in design and manufacture. All Winter Taps give Balanced Action performance.



EXACT FLUTE SPACING

UNIFORM FLUTE CONTOURS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A search that never ends—

In National's testing laboratories, better ways to cut metal are constantly sought. Many have been found, and used to improve the performance of National Tools

Twist Drills • Counterbores
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NATIONAL TWIST DRILL AND TOOL COMPANY

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A group of Cincinnati craftsmen, who have for years produced fine carbide tools, are now working with ultra-modern facilities in the new Staples plant. Their skill and conscientiousness can help reduce your production costs.

Please note the change of address:

THE *Staples* TOOL COMPANY

2352 Glendale—Milford Road, Evendale, Cincinnati 15, Ohio

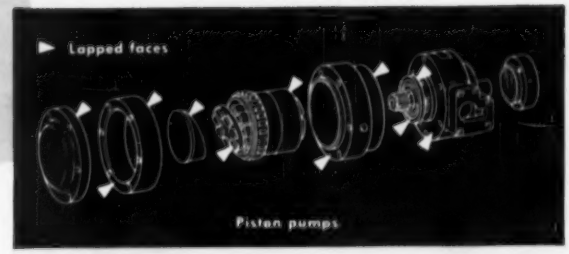
Staples

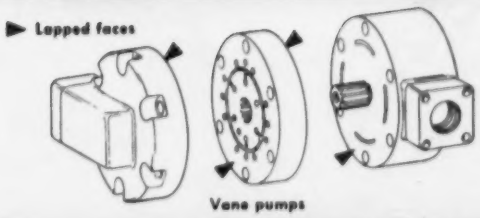
ROTATING CUTTING TOOLS CARBIDE-TIPPED

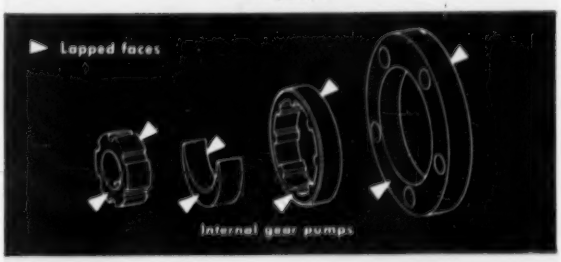
How Pump Manufacturers Use the Lapmaster® To Improve Product Performance

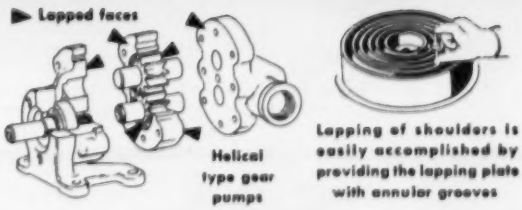
Like valve manufacturers, a large number of pump manufacturers need precision flatness and finish in order to insure efficient product performance. They're getting *both* flatness and finish plus parallelity in production quantities with Lapmasters. Photos at right illustrate a few typical parts being machined daily.

The high production accuracy of the Lapmaster (micro-inch finishes of 2 to 3 RMS—surface flatness to less than .000011" when required) is being achieved on all materials including cast iron, steel, stainless steel, magnesium, aluminum, brass, carbon, ceramics, plastics and sintered metals. It will pay you to investigate this modern precision, yet economical, method of machining.








Lapped faces
Helical type gear pumps
Lapping of shoulders is easily accomplished by providing the lapping plate with annular grooves

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FREE TECHNICAL DATA
These three booklets will give you the facts on producing and measuring precision flatness and finish. Write for your copies today.

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MECHANICAL PACKINGS

SHAFT SEALS

TEFLON PRODUCTS

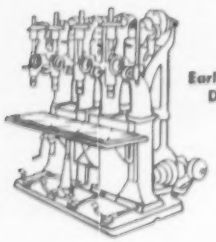
LAPPING MACHINES

THREAD COMPOUNDS

CRANE PACKING COMPANY

W. F. & JOHN BARNES
1872-1956
FROM

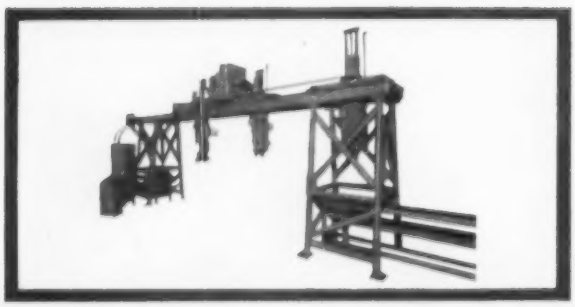
Foot Powered Scroll Saw

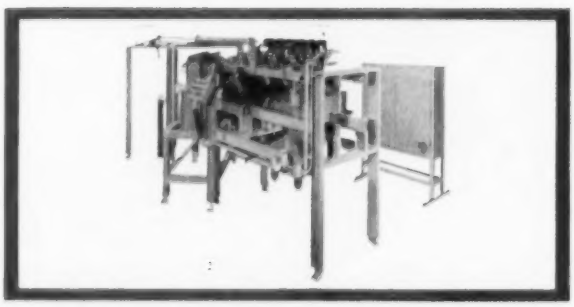


Early Gang Driller

● It was back in 1872 when the ox cart was still used for transporting goods and Edison was still experimenting with the electric light, that W. F. & John Barnes built their first industrial machine — a Foot Powered Scroll Saw. Later in the 1880's, the first Gang Drilling Machine was designed and built. This forerunner of the modern machine tools of today was shipped by ox team to a customer in a nearby town. Three days later, the records say, it arrived at its destination — a distance of 40 miles.

It is also a matter of record that all through these years, from oxen to jets, machines bearing the W. F. & John Barnes' name have been consistently associated with progressive developments and improvements in manufacturing methods. As a result, when you specify a Barnes' built machine today, you get a creative engineering and building service that is seasoned by experience — one that is complete and geared to serve your needs better than ever before.





▲ **SPECIAL CONVEYORS** — typical of variety of units designed and built from standard components to increase material handling efficiency between machining operations. Engineered to meet individual job requirements.

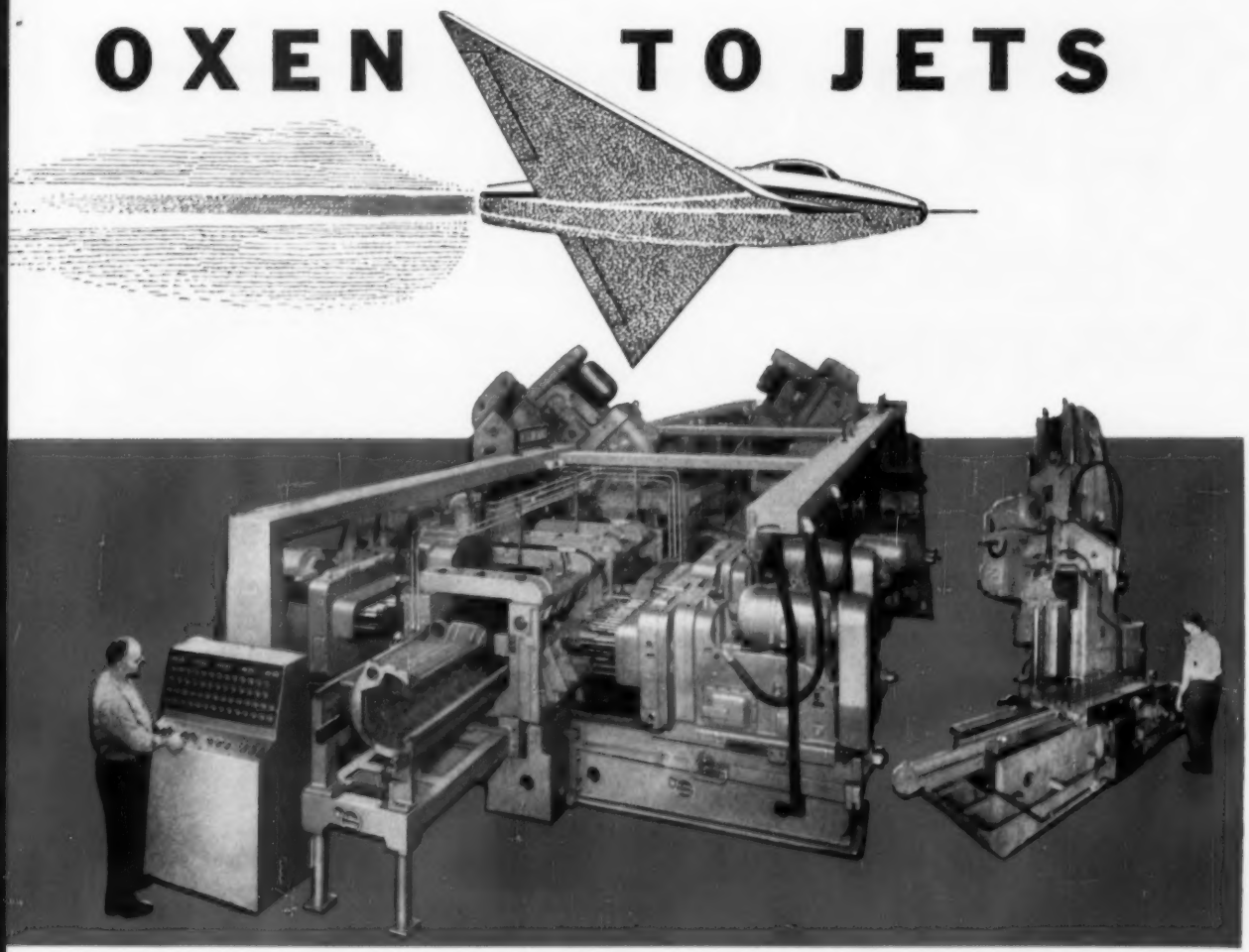
▲ **SPECIAL AUTOMATION EQUIPMENT**—includes a range of turn mechanisms, (illustrated), special transfer and unloading equipment, inspection, and assembly machines, designed for automatic or semi-automatic production-line operations.

W. F. & JOHN BARNES

BUILDERS OF BETTER MACHINES SINCE 1872

MULTIPLE SPINDLE DRILLING • BORING • TAPPING

OXEN TO JETS



MODERN MACHINE TOOLS — units illustrated are typical of the large Progress-Thru and Single Station units designed and built by Barnes. 11-Station unit at left was designed to machine both 4 and 6-cylinder tractor engine blocks at 25 pieces per hour. Single-spindle machine at right slab and face mills motor frame mounting pads at 6½ pieces per hour.

SPECIAL ELECTRICAL CONTROLS — a typical Barnes unitized control system of the sequence type. All are designed to assure the most dependable service and are built to best serve your specific needs.

ELECTRO-GRAPHIC DETECTOR SYSTEMS — a new, exclusive Barnes development. Cuts maintenance time on complex electrical controls up to 90%. Wired-in checking system pin-points malfunctioning elements.

Write **FOR FREE LITERATURE** — New 8-page brochure illustrates and describes Barnes' expanded facilities . . . outlines 6-Point Coordinated Machine Tool Designing and Building Service.

W. F. & JOHN BARNES COMPANY • 401 SOUTH WATER ST., ROCKFORD, ILLINOIS

MACHINES • AUTOMATIC PROGRESS-THRU AND TRANSFER TYPE MACHINES

New ARMSTRONG

Armide CARBIDE INSERT TOOL HOLDERS

STYLE TR
(opposite Hand TL)
Holds Triangular 6-edge, Armide and other carbide "throw-away" inserts.

STYLE SR
(opposite Hand SL)
Holds square, 8-edge, Armide and other carbide "throw-away" inserts.

Buy ARMSTRONG TOOLS from your Industrial Distributor

Write for catalog

Embody...Convenience, Economy Simplicity and Strength based on these superior features:

- **IMPROVED CLAMPING METHOD**—speeds indexing of Inserts.
- **REPLACEABLE SEAT of Hardened Tool Steel**—protects shank and provides flat base to prevent damage to inserts as they are clamped in position.
- **SHANK of Heat Treated Alloy Steel**—gives extra strength and rigidity.

A slight turn of a single screw permits rapid indexing of the ARMIDE insert—reducing down time to a minimum.

The use of ARMIDE "throw away" inserts provides the economy of multiedged inserts—triangular inserts have six, square inserts eight cutting edges. These are available in Utility or Precision finish and in three grades of ARMIDE: 350, 370 or 883.

Protection to the shank is given by the replaceable tool steel seat which prevents wear and damage to the shank and provides a flat base for the insert reducing the possibility of damage to the insert as it is clamped in place. A relief groove is ground into the seat providing clearance when a dulled insert with "built up" edges is turned over.

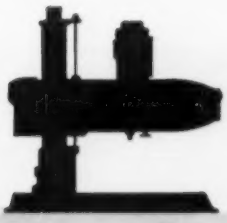
ARMSTRONG ARMIDE Carbide Insert Tool Holders are furnished in two styles and three sizes. Complete data on these tools is given in Bulletin CIT, mailed on request.

SEE US AT BOOTH 1324 A.S.T.E. SHOW
INTERNATIONAL AMPHITHEATRE CHICAGO MARCH 19-23

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

5215 W. ARMSTRONG AVENUE CHICAGO 30, ILL.



NEW HEAD CONTROLS make Fosmatic Radial easier than ever to run!

Numerical Dials select feeds and speeds quickly, easily, with minimum possibility of error. Select even while drill is running, to save time on next operation.

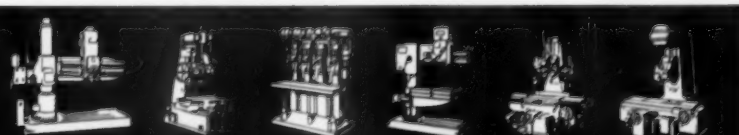
Single Control Lever starts, stops, reverses and shifts to feed and speed set on numerical dials.

Push Buttons on quick return levers engage feed. Feed is disengaged automatically by depth control or by pushing either button again. Magnetic clutch needs no adjustment.

Head Traverse Lever also elevates arm. Variable speed hydraulic motors drive both traverse screw and elevating nut. Clutches eliminated.

Other Fosmatic features include: 36 spindle speeds, 18 feeds, 4' to 8' arms, 13" to 19" columns, Boring Type Spindle, Safety Interlocks, Variable-Tension Counterbalance for Spindle, and optional Milling Feed

NEED DRILLING EQUIPMENT? GET A PROPOSAL FROM FOSDICK!



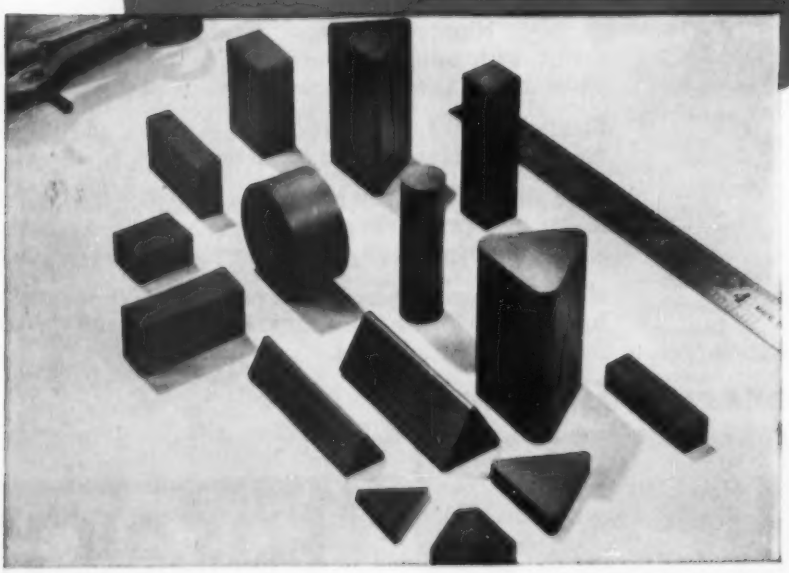
Fosmatic Radial Drills | Jig Borers | Sensitive and Upright Drills | Sensitive Radial Drills | Jig Grinders | Automatic Positioning Jig Borers

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

FOSDICK

Announcing

a new high strength oxide cutting tool



See STUPALOX Tools demonstrated at Booth 1309, ASTE Industrial Exposition, Chicago, March 19-23.

Available in commercial quantities NOW!

STUPALOX

Outperforms other cutting tools TWO TO TEN TIMES!

Deeper cuts, faster speeds, high surface finish and longer tool life are obtained by using STUPALOX cutting tools. Compared with other commercial tools in field tests under a variety of actual operating conditions, STUPALOX outperformed the best of these tools *two to ten times!* The limiting factor in many test demonstrations was the power and rigidity of the machine tool.

The perfection of STUPALOX is the climax of more than thirty years of oxide application development by Stupakoff, a leader in the field of technical ceramic materials. Extensive research and engineering studies, and broad manufacturing experience have been focused on the development of STUPALOX.

STUPALOX is available *now* in commercial quantities, and in a variety of sizes and shapes. We will be glad to send technical data. Use the coupon.

Stupakoff DIVISION OF The CARBORUNDUM Company — LATROBE, PENNSYLVANIA

Send for Bulletin

It gives production figures with Stupalox tools, physical and mechanical properties and operating data.

(AM)

STUPAKOFF Division of
The Carborundum Company
Latrobe, Pennsylvania

Please send a copy of STUPALOX Bulletin No. 156 to:

Name _____ Position _____

Company _____

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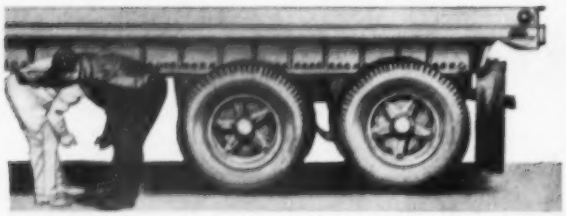
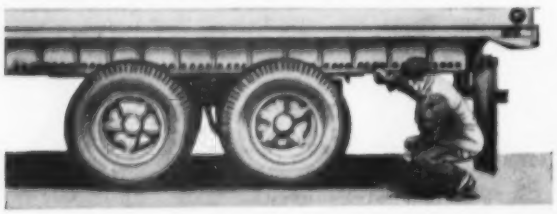
Wrought Everdur* Cuts Cost in Half

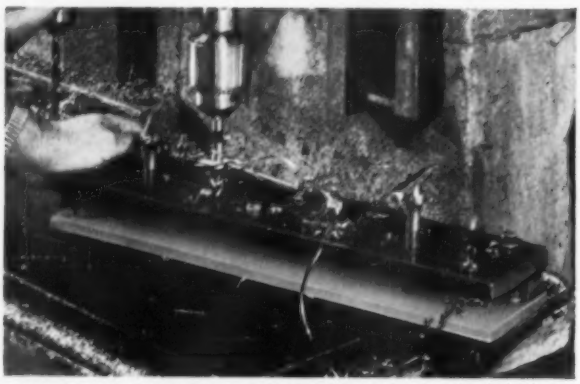


THE TRAILMOBILE SHIFTABLE TANDEM—Truckers often lose time and money in shifting trailer cargo, changing tractors, or cutting payload to meet legal axle-weight requirements. Now, however, they can balance any load in just five minutes by moving the Shiftable Tandem Axle Assembly made by Trailmobile Inc., Cincinnati, Ohio. The axle assembly slides forward or backward, as needed, along a stainless steel rail on four shoes of wrought Everdur. It can move 66 inches and be locked at 3-inch intervals by locking rods through holes in the rail.

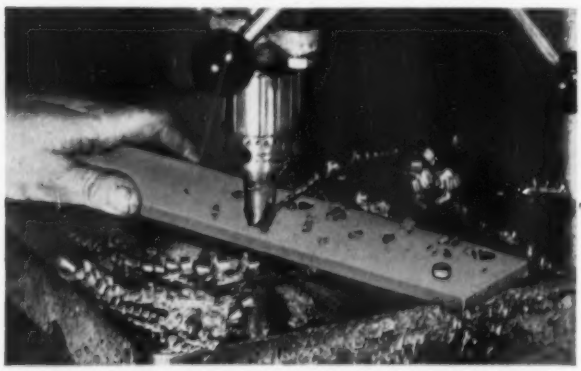


EVERDUR CAN TAKE THE LOADS AND SPLASH—One of the shoes of wrought Everdur installed in the Shiftable Tandem frame. An Alemite fitting in center hole and oil grooves provide lubrication. The Everdur shoes carry normal tandem loads of 32,000 pounds day and night, and slide freely under this pressure. Resistance to corrosion is another reason why Everdur was selected, for unlike the trailer's cargo, the Everdur shoes are exposed to road splash of varied mixtures.

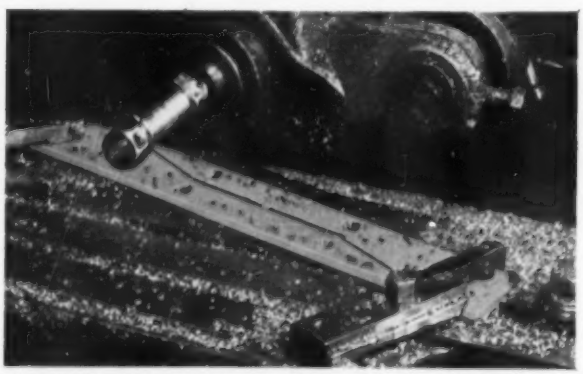
Wherever metal must resist corrosion, be strong and tough, and be available in forms easily fabricated, consider Everdur, Anaconda's family of copper-silicon alloys. The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. *Reg. U.S. Pat. Off. 5661



HOW WROUGHT EVERDUR CUT MATERIAL COSTS—Trailmobile first tried high-tin bronze castings for the shoes on which the assembly slides. But rejects for porosity and warpage in the thin cast section were a costly problem—and all surfaces had to be finish-machined. The wrought Everdur bar stock suggested by Anaconda's technical experts has surfaces satisfactory as delivered—ready for drilling holes (shown above).



HOW WROUGHT EVERDUR CUT LABOR COSTS—The castings formerly used were not uniform. Hard spots made surface machining difficult and expensive. The entire operation was unnecessary with wrought Everdur bar stock—reducing labor cost by about 50 per cent. (Above) Countersinking holes for screw fastenings.



WROUGHT EVERDUR IS READILY MACHINABLE—Though tough and dense, wrought Everdur is uniform and poses no special problems in machining. Oil grooves are shown being milled in the shoes.

EVERDUR

ANACONDA® COPPER-SILICON ALLOYS

Come to the ASTE Show!

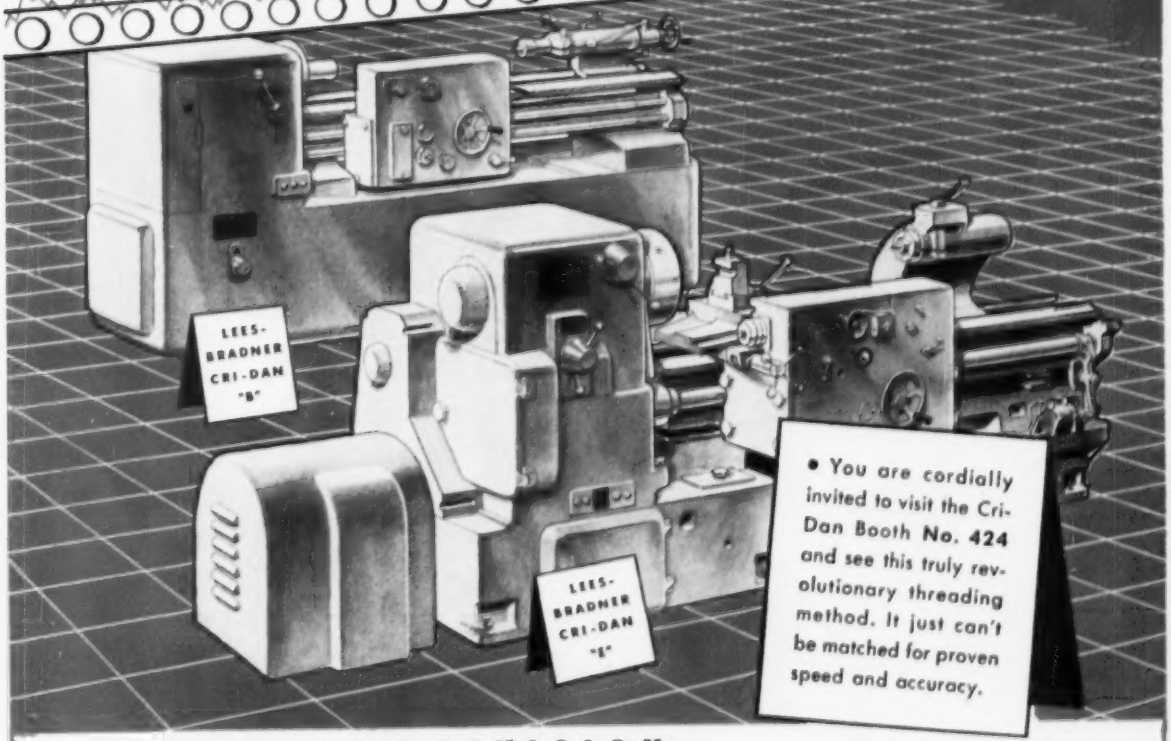
INTERNATIONAL AMPHITHEATER

CHICAGO · MARCH 19-23, 1956

STARRING

THE CRI-DAN

"THE ONLY PROVEN SINGLE POINT THREADING MACHINE!"



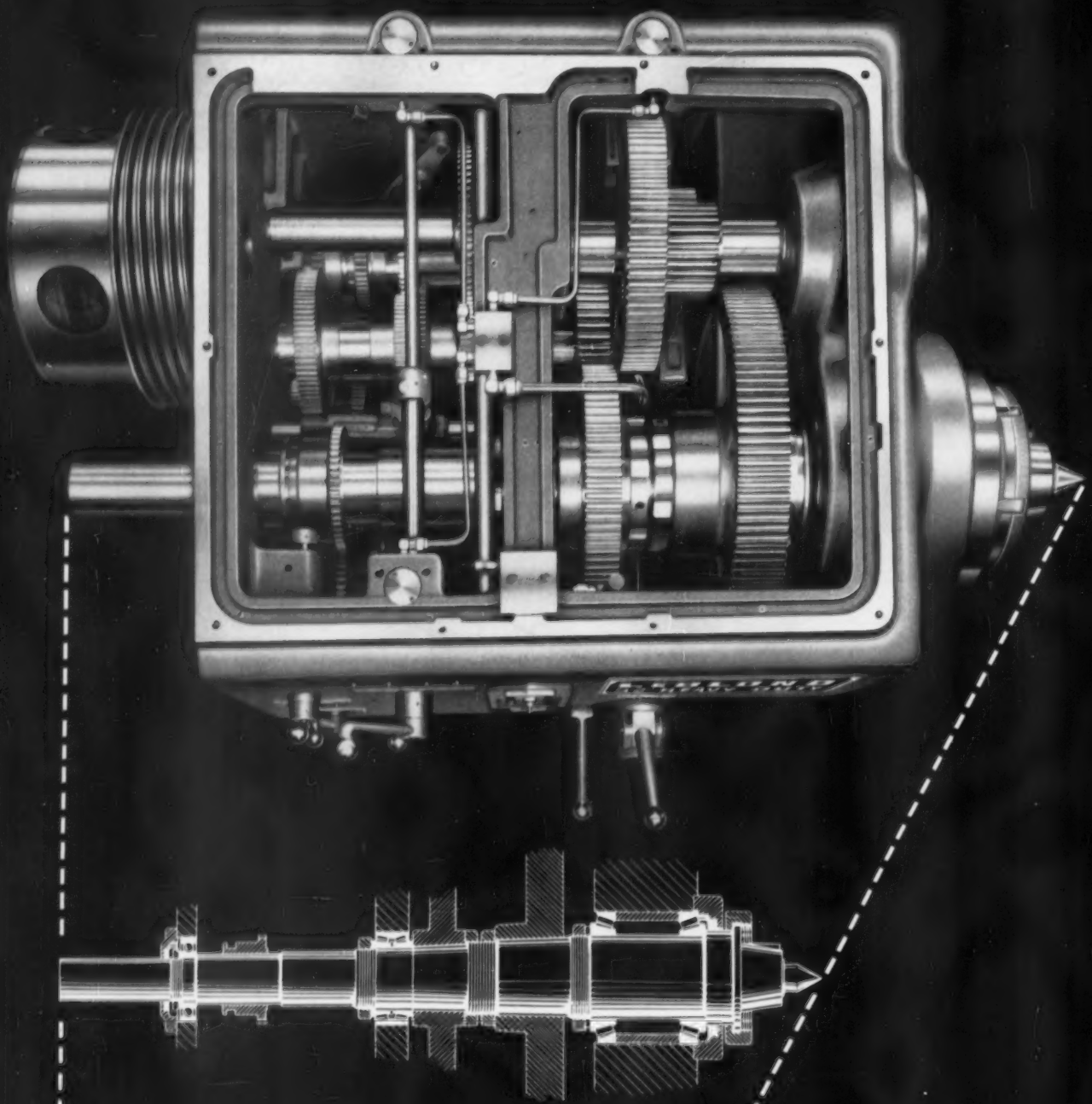
• You are cordially invited to visit the Cri-Dan Booth **No. 424** and see this truly revolutionary threading method. It just can't be matched for proven speed and accuracy.

CRI-DAN DIVISION

the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

Designing LeBlond lathes for



Take a look inside the new LeBlond headstock—designed from the ground up to deliver high horsepower effectively.

60·HP turning was an inside job

This new headstock is the power secret of the LeBlond 32" Heavy Duty.

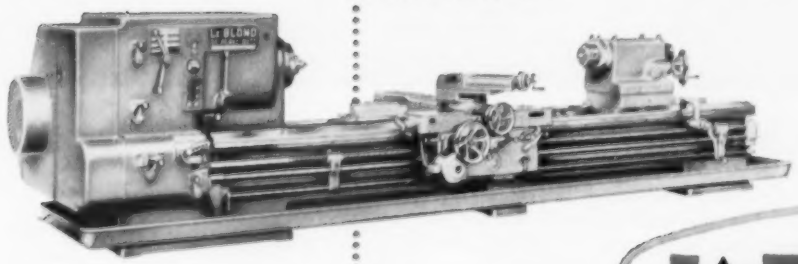
Notice how short and heavy the shafts are—to minimize deflection. Look at the fine-pitched, wide gears—for better tooth action and greater load-carrying capacity. They're hardened and ground for all speeds except low back gear. Free-running spur gear design assures minimum no-load friction horsepower. Shafts and gears not needed for a given speed remain idle, do not consume any power. The new 4-bearing spindle gives maximum rigidity, has twin Timkens at front, double-row Timken at center, ball bearing at rear.

Of all the lathes in the world, the LeBlond 32" Heavy Duty was selected by a leading manufacturer of carbide tools, to be modified for grueling laboratory tests. Using 125 hp drive, cuts were made with a measured 118 hp at the tool—*210 cubic inches of SAE 1045 removed per minute!*

Results like this call for a machine built in every detail for high-horsepower turning. The new headstock design is typical of the engineering in every element of the new LeBlond 32" Heavy Duty. The totally-enclosed quick change box, the hardened rack, 4-directional power rapid traverse, hardened and ground steel bedways, thrust-lock tailstock.

Whatever your turning needs—high power or high production, small swing or large—LeBlond makes a lathe you can trust with the job. 76 different models to choose from. Today, see your LeBlond Distributor or write—

36 speeds, new adjustable acceleration. From 4.5 to 500 rpm. New and exclusive adjustable acceleration brings heavy work pieces up to speed safely; any percentage of full torque can be selected for the first five seconds. Similar adjustments can be made for stopping and jogging, by means of three rheostatic controls to the electric clutch and electric brake. Hydra-Trace duplicating attachment optional. Write for Bulletin HD-165 for full details.



...cut with confidence

LeBLOND of Cincinnati

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 69 YEARS*

PAN AMERICAN

Grinds holes plus 0.0003", minus 0.0000" on RIVETT

Magneto Bearing Support. Bearing size is 1.5749" dia. Tolerance is plus 0.0003", minus 0.0000".

Rivett Model 1024 Internal and Universal Grinder. Double-end wheelhead swivels 180° for quick conversion. Hole to 9" dia., external to 12" dia. Collets mount directly in workhead spindle.

Maintenance contributes to Pan American World Airways System's excellent reputation for safety and dependability.

At the Latin American Division Overhaul Base in Miami, Fla., Pan American has been using a Rivett Model 1024 Internal and Universal Grinder on small hole work for 3½ years.

Pan Am states: *"The Rivett Grinder is in operation during two eight-hour shifts per day, five days per week. The only service has been lubrication and replacement belts. It is considered the most accurate and productive universal grinder in the shop. We have another machine on order."*

This testimony to Rivett accuracy and productivity has company in similar statements by other Rivett users. Write for Bulletin 1024B and get the details of how Rivett can improve your toolroom and small lot grinding.

RIVETT LATHE & GRINDER, INC., BRIGHTON 35, BOSTON, MASS.

Rivett Lathe & Grinder, Inc.
Dept. AMR3, Brighton 35, Boston, Mass.
Send Free 12-page Catalog 1024B.

Name_____

Company_____

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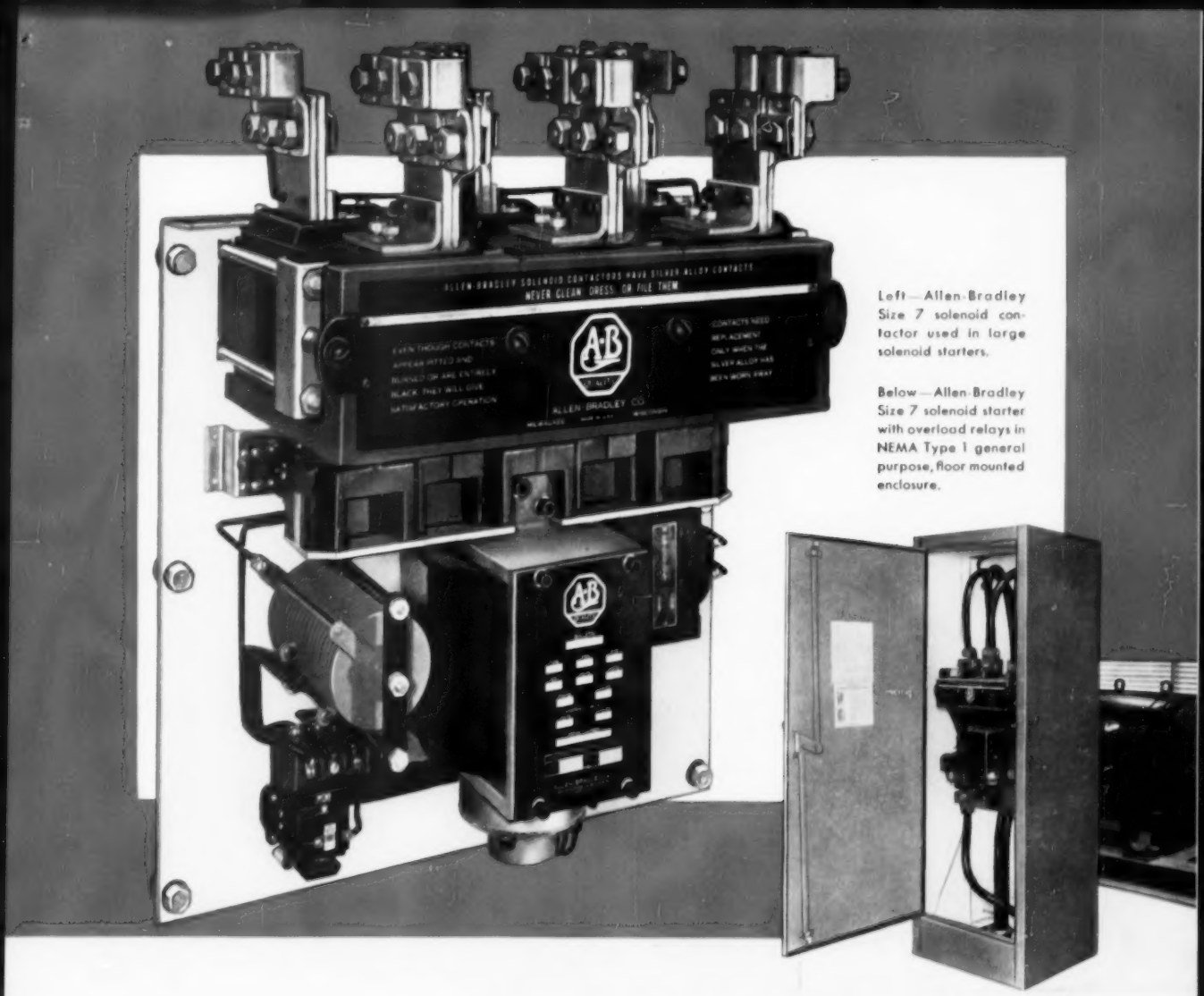
RIVETT

A Symbol of Accuracy in Machine Tools

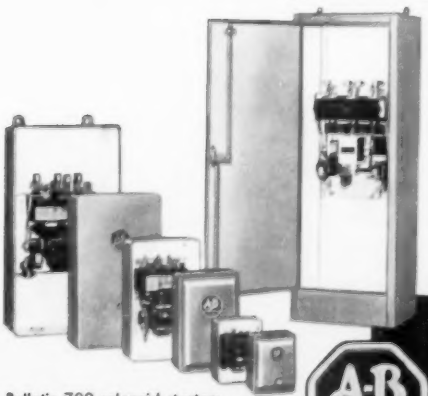

ALLEN-BRADLEY SOLENOID CONTACTORS HAVE SILVER ALLOY CONTACTS
NEVER CLEAN, DRESS, OR FILE THEM
EVEN THOUGH CONTACTS APPEAR PITTED AND BURNED OR ARE ENTIRELY BLACK THEY WILL GIVE SATISFACTORY OPERATION
CONTACTS NEED BE REPLACED ONLY WHEN THE SILVER ALLOY HAS BEEN WORN AWAY
A-B
ALLEN-BRADLEY CO.

Left—Allen-Bradley Size 7 solenoid contactor used in large solenoid starters.

Below—Allen-Bradley Size 7 solenoid starter with overload relays in NEMA Type 1 general purpose, floor mounted enclosure.

ALLEN-BRADLEY SOLENOID STARTERS USE DOUBLE BREAK, SILVER ALLOY CONTACTS THROUGHOUT!

Eight Sizes **up to 300 hp, 220 v; 600 hp, 440-550 v.**



Bulletin 709 solenoid starters shown here in Sizes 0 to 6—all equipped with accurate and reliable overload relays.

All starter manufacturers use the solenoid construction and double break, silver alloy contacts for their lower starter ratings, because experience has proved this construction superior to any other. Therefore, wouldn't this experience repeat itself with the higher rated starters?

Allen-Bradley has found this to be absolutely true. Its starters of high hp rating are regularly establishing new standards of starter performance. As you go from size to size, the operating characteristics remain the same—you get trouble-free, long-life performance.

Standardize on Bulletin 709 solenoid starters—they are Tops in Quality!

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

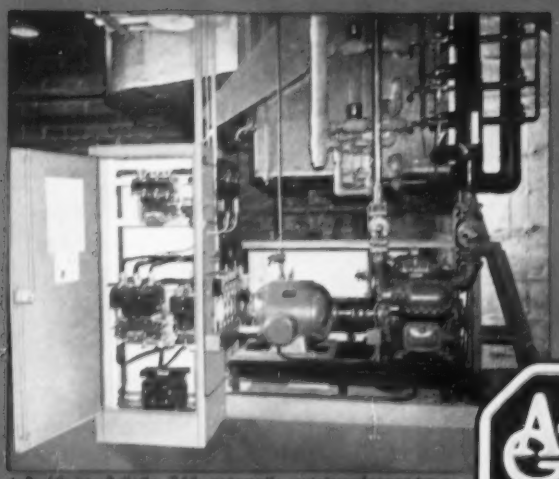
3-56-MR

A-B Quality

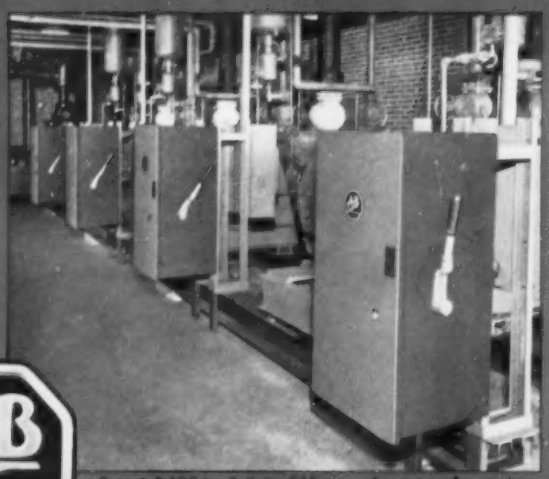
ALLEN-BRADLEY

SOLENOID STARTERS

QUALITY

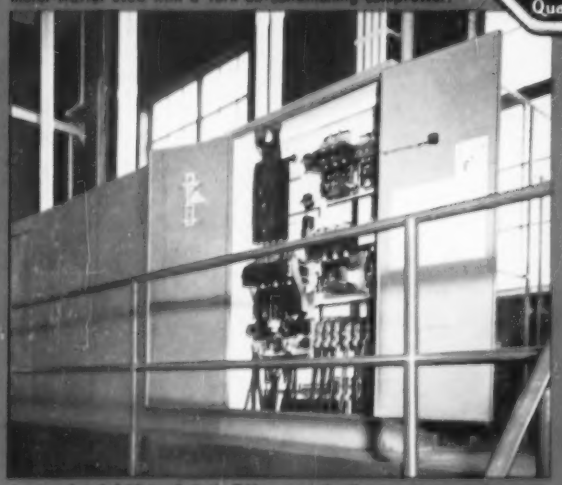


A-B 60 hp Bulletin 746 automatic autotransformer-type motor starter used with a York air-conditioning compressor.



Four A-B 125 hp Bulletin 646 manual autotransformer-type motor starters used with refrigeration compressors in a dairy.

A-B Quality



A row of A-B 350 hp Bulletin 761 automatic slip-ring motor starters with circuit breaker disconnects in the Milwaukee sewage disposal plant.

Allen-Bradley Bulletin 798 multi-unit control center used with motors ranging from 10 to 75 hp installed in a southern Kraft board plant.

ALLEN-BRADLEY STARTERS FOR LARGE A-C MOTORS ARE AS POPULAR AS THE BULLETIN 709 SIZE 1 FOR SMALL MOTORS

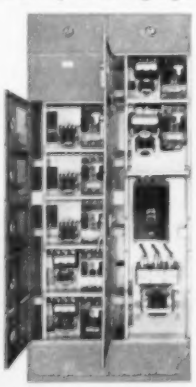
Allen-Bradley manual and automatic starters for large squirrel-cage, slip-ring, and synchronous motors—both high and low voltage—have earned the same reputation for "Quality" for which the lower ratings are known. Every operating requirement can be satisfied, either with individual units or as sections of a multi-unit control center.

Allen-Bradley high voltage starters are rated up to 1500 hp with voltages ranging from 2000 to 4600 volts. The high voltage, synchronous motor starters are self-protecting against short circuits up to 250,000 kva on 2501-4600 volts, 3 phase, 60 cycles. Oil or air break switching available. Please write for the Handy Catalog.

A-B automatic autotransformer, reduced voltage starter with cabinet open to show control panel.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada—Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY
SOLENOID STARTERS
QUALITY

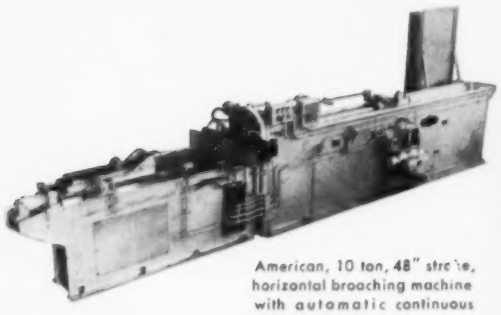


A-B multi-unit control center with compartment doors open to show various types of motor controls.

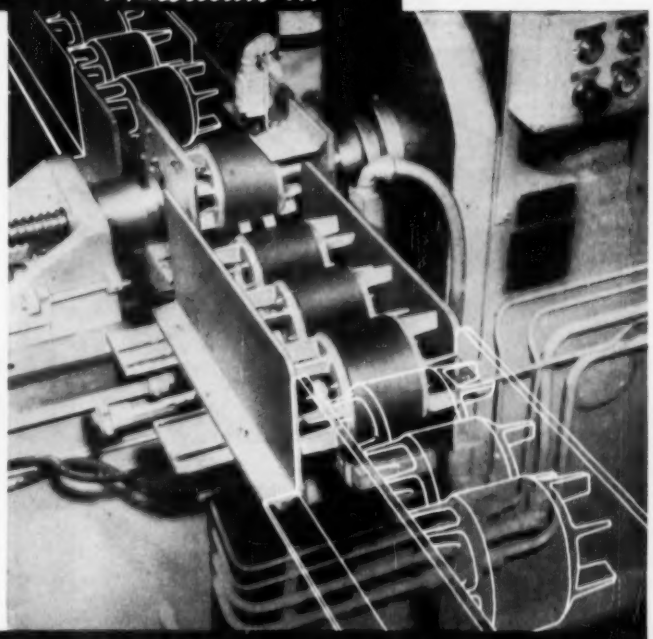
3-56-MR

more about **AUTOMATION** by *American* ...

Broaching I.D. of rotors boosted to 200 PER HOUR

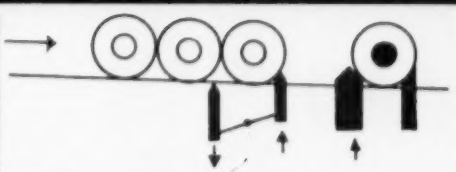


American, 10 ton, 48" stroke, horizontal broaching machine with automatic continuous broaching cycle.

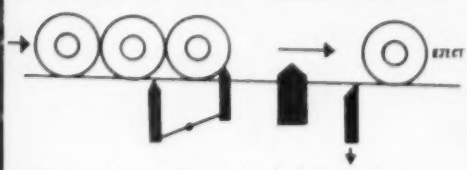


PARTS FED AND EJECTED AUTOMATICALLY ON INCLINED CHUTE

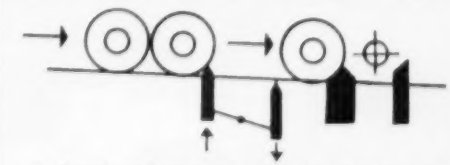
1 As cycle starts, split vee drops and part rolls into broaching position.



2 Broaching stroke begins. Retaining jack drops and second part rolls into hold position.

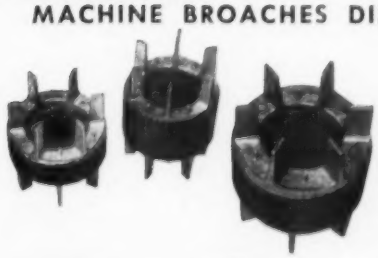


3 Broaching stroke completed. Split vee drops and part is ejected.



4 Broach carriage returns. Retaining jack drops and second part rolls against split vee.

MACHINE BROACHES DIFFERENT ROTOR SIZES



Thrust bushings on the clamping mechanisms seat in the I.D. of the rotors' fan sections. Simply by changing these bushings and adjusting the chute guides horizontally and/or vertically, rotors of varying diameters and thicknesses are broached on the same machine.

Whatever degree of automation is included in your production planning, if it involves broaching or machine assembly, American engineering can help you greatly. 'Phone or write us details.

Ask for Catalog No. 450

AMERICAN *American* BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

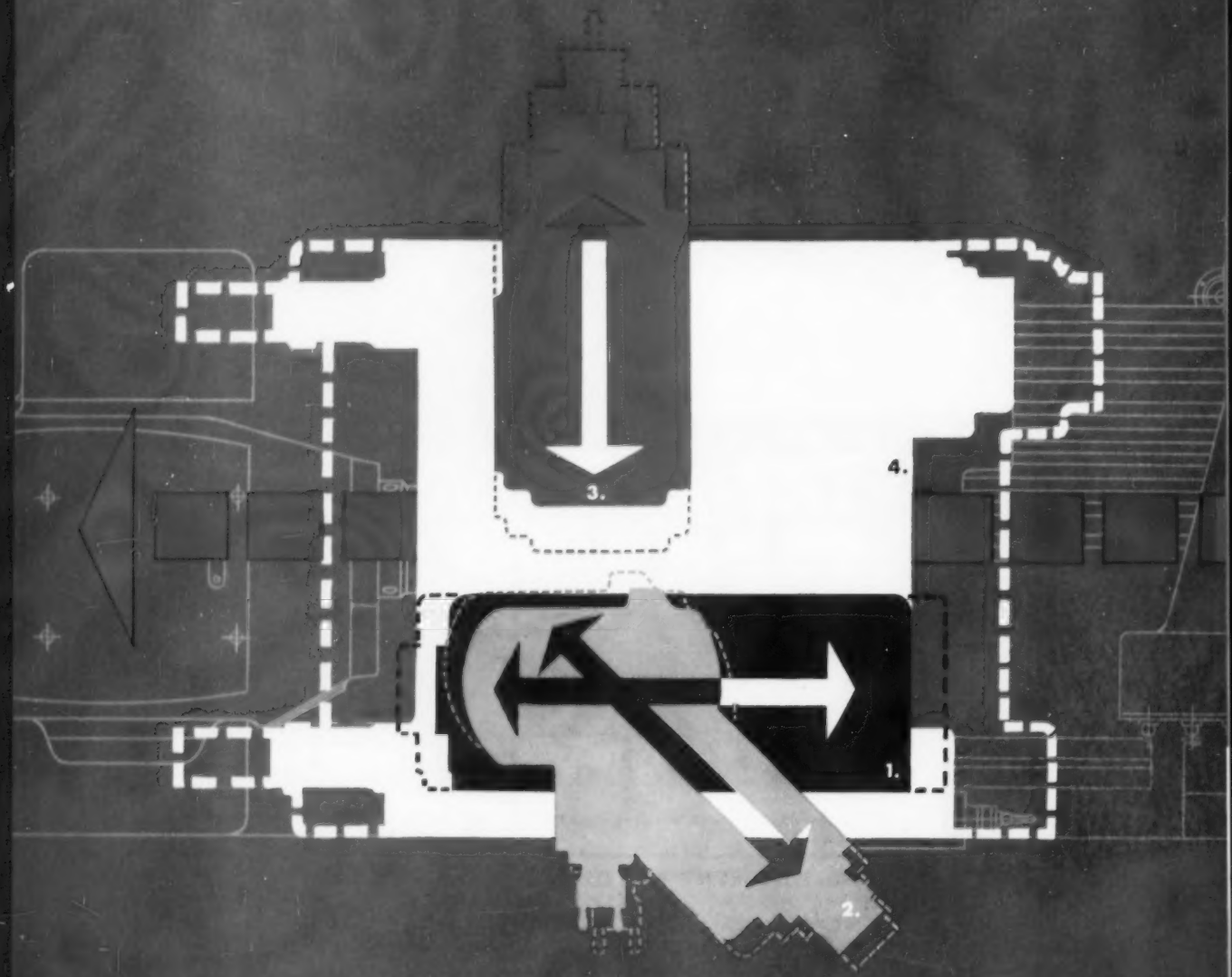
ANN ARBOR, MICHIGAN

SUNDSTRAND

See *American* First — for the Best in Broaching Tools, Broaching Machines, Special Machinery

ACTION That's the Word for Hydra-Slide!

ARROWS SHOW SLIDE MOVEMENTS OF MONARCH'S NEW AUTOMATIC CYCLE CHUCKING LATHE



1, 2. Basic unit, most models—hydraulically operated front slide unit, on which is mounted famous Monarch Air-Gage Tracer. Utilized generally for straight or contour turning, facing, or boring.

3. Hydraulically operated rear slide unit for necking and grooving—is ideal with proper tool setting for facing, for which hydraulic automatic tool relief is provided.

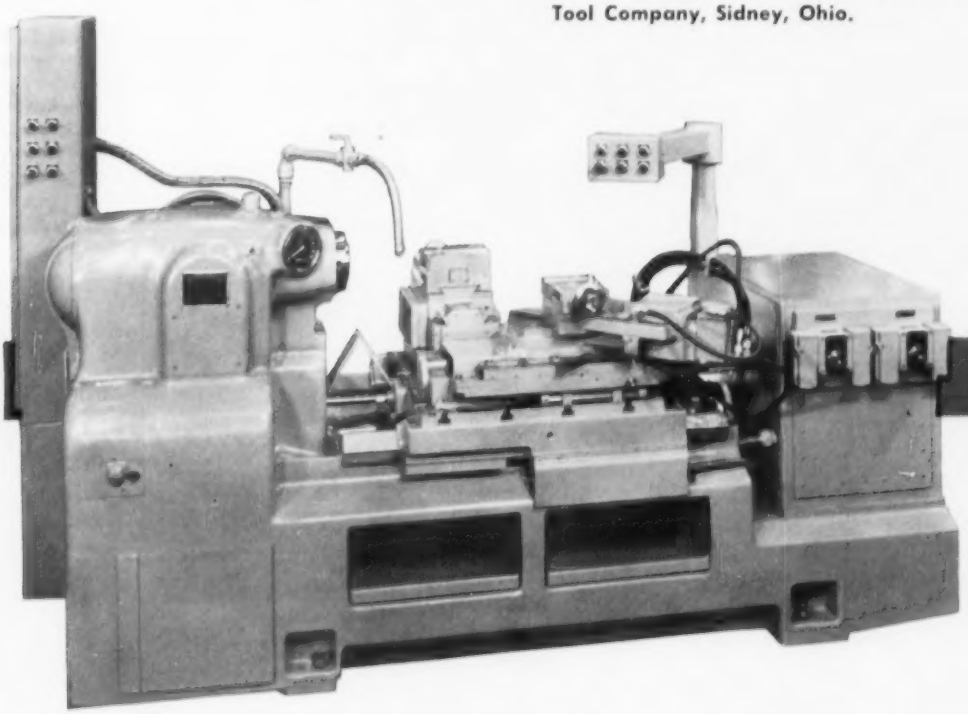
4. Platen with hydraulic movement, on which both front and rear slide units are mounted. Speeds cycle for work piece change!

HERE'S ACTION in the fight against rising production costs—with a fully automatic cycle controlling an extremely effective combination of hydraulic slide movements. Look them over! Here's an exceptionally versatile, high production chucking lathe for both first and second operation work.

Although the typical cycle presumes a tool or tools on both front and rear slides, and is based on the ideal production-wise situation of simultaneous operation of slides—the versatility of the machine is such that many variations can be set up. Of course, there are convenient all-electrical controls for effortless and positive setup.

The Hydra-Slide has ample capacity as to work size and stock removal both, with work diameter capacity up to 15" over front slide unit —up to 13" over rear slide unit—and work drive motor ratings up to 20 H.P.

Here's action—production-wise and cost-wise! You should know *all* about a machine like this. Send the coupon today for our complete illustrated booklet #1703—**The Monarch Machine Tool Company, Sidney, Ohio.**



The Monarch Hydra-Slide. Front Slide, with Air-Gage Tracer, provides smooth, stepless cut for multiple diameters, tapers, faces, radii and chamfers with single-tool economy. One or more tools on rear unit neck, groove, form cut, and face. Both mounted on platen. Send coupon for complete story.

Monarch
TURNING MACHINES
FOR A GOOD TURN FASTER . . . TURN TO MONARCH

THE MONARCH MACHINE TOOL COMPANY
SIDNEY, OHIO

Please send me your illustrated booklet #1703 on the new Monarch Hydra-Slide.

NAME _____ TITLE _____

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the finest high speed lathes

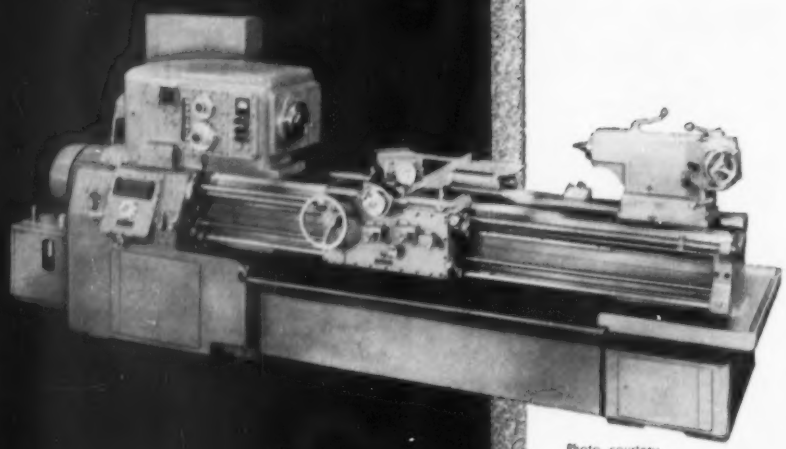
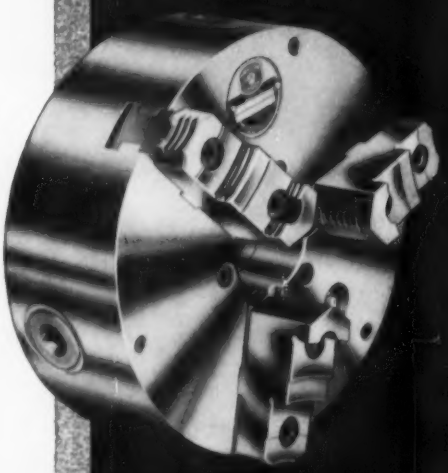


Photo courtesy
The Monarch
Machine Tool Co.

This is Monarch's Series 62 with Preselector Dyna-Shift designed to increase productivity and lengthen tool life. This fine lathe is typical of the quality machine tools built by Monarch. Write for Booklet #1505 for complete data. The Monarch Machine Tool Company, Sidney, Ohio.

deserve the finest precision chucks



This is Horton's 3-Jaw Scroll Universal Chuck which for over 100 years has been the ideal complement to the world's finest tool room, general purpose and production lathes. Its precision and lasting accuracy make it a part of any production picture. For the complete story on this and Horton's complete line of precision chucks, see the Horton people in your area now.

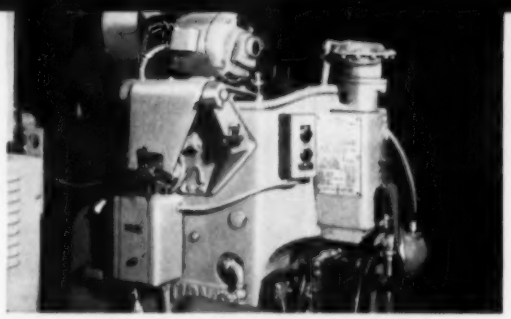
HORTON
Since 1851
CHUCK

WINDSOR LOCKS, CONN.

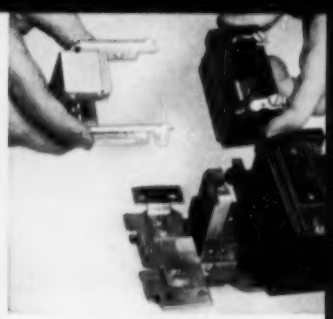
Where to use
3 KINDS OF G-E MAGNETIC STARTERS
and why . . .

NON-REVERSING STARTERS—for all full-voltage, single-speed motor applications

When remote control is desired, or when motors are started and stopped frequently—such as on machine tools, compressors, blowers, or similar equipment—use G-E magnetic starters. The strongbox coil is layer-wound with insulated wire, and impregnated with a solventless varnish. The windings are enclosed in a molded case which keeps out moisture and oil, and helps protect against accidental damage.



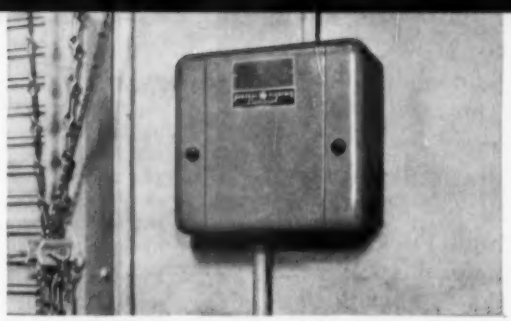
NON-REVERSING STARTER ON WELDER



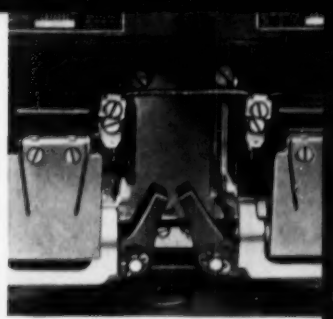
STRONGBOX COIL

REVERSING STARTERS—for control of motors which rotate in both directions

To control motors which reverse direction—on hoists, door openers, and planers, for example—select G-E reversing starters. They consist of two separate starters in a single case, with an interference-type mechanical interlock which prevents short circuits caused by one starter closing before the other starter opens the circuit. Extra electrical interlocks are also available.



REVERSING STARTER ON OVERHEAD DOORS

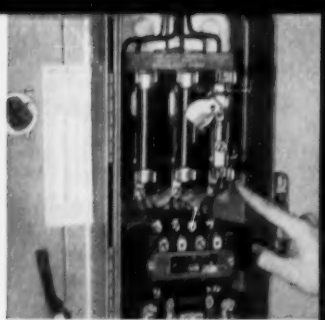


MECHANICAL INTERLOCK

COMBINATION STARTERS—for starter and short-circuit protection in one unit

G-E combination starters—which come in both reversing and non-reversing forms—have the extra feature of a fusible, or non-fusible disconnect switch, or circuit breaker for short-circuit protection and manually disconnecting the motor from the line. Interchangeable fuse clips provide maximum flexibility, enable you to adapt your starter to new circuit conditions. 733-5

COMBINATION STARTER ON TURRET LATHE



DISCONNECT SWITCH

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For further information write for bulletin GEC-1260, or contact your nearest General Electric Apparatus Sales Office or Distributor.

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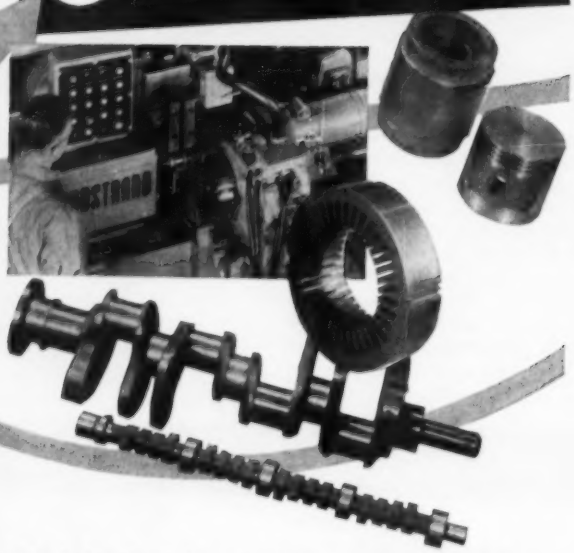
BLOOMINGTON, ILLINOIS

How Sundstrand "Engineered Production" Has Been Applied To:

Production requirements dictate the proper design and tooling for all machine tools. If the required production is low and many similar parts are to be produced on the same machine, the most economical type of tooling and equipment is one that can be readily adjusted so that there will be a minimum of down time for change over. If the required production is high, the reverse is true, since the problem then is primarily one of tool maintenance coupled with automatic handling of work parts.

Sundstrand engineers have accumulated a vast knowledge of tooling from handling a wide variety of jobs. Here are just a few examples of Sundstrand "Engineered Production" as applied to turning problems.

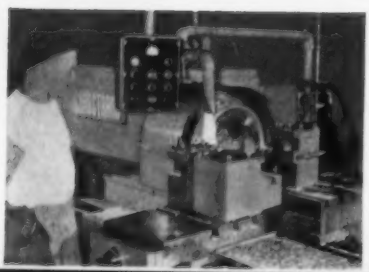
1 High Production Turning



The lathe above is a good illustration of a high production setup. Motor rotors are turned and faced at a production rate of over 200 pieces per hour. The machine is automatically loaded and unloaded, parts and tools are gaged for wear. Machine runs approximately an 8 hour shift, re-setting the tools automatically before a normal replacement of the tool head is necessary.

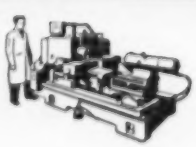
Pistons, cam shafts, crankshafts, etc. lend themselves to many of the features incorporated in this machine. If you have parts of this nature produced in large quantities, see what Sundstrand "Engineered Production" service can develop for you.

2 Small Lot Turning



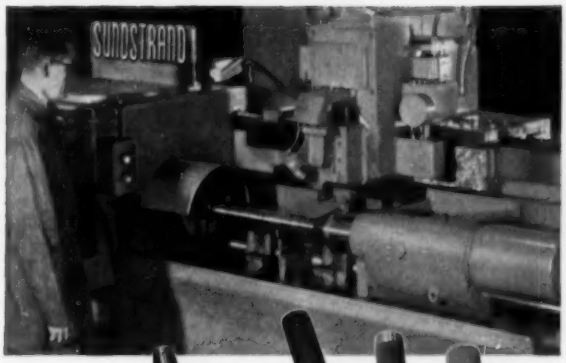
SUNDSTRAND "Engineered Production" Service"

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS



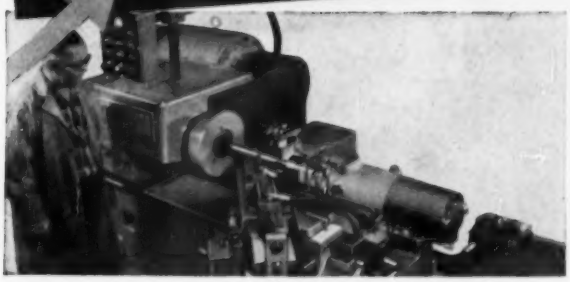
In the illustration at the left below, more simple tooling, easily adjusted, has been provided to handle a number of different sizes of similar parts. Tool adjustments are easy because of the simplicity of the tooling, and the quick set cycle control of the Sundstrand Automatic Lathe makes it profitable to use multiple tooling on jobs of this nature.

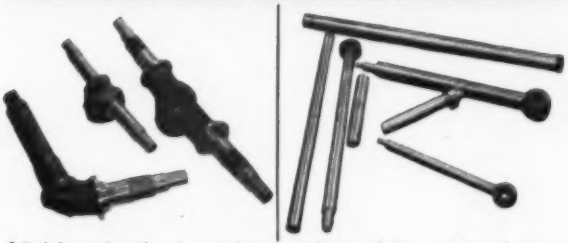
4 Shaft Turning



This machine is offered with punch card control or manual operation. With punch card control, it brings production control to the engineering department. Again, it is a design solution to turning of shafts, but talk to Sundstrand Engineers and investigate Sundstrand "Engineered Production" for the proper solution to your job.

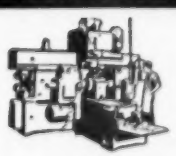
3 Tracer Turning

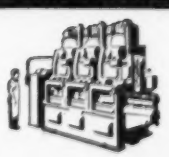




Multi-cycle single point turning of irregular shapes can be obtained quickly and easily with new Sundstrand Automatic Lathes equipped with this tracer control. The lathes are provided with a template controlled tracing unit, which replaces the regular front carriage. Ruff, semi-finish and finish cuts can be made with one turning tool in one automatic cycle.

TRIPLEX RIGIDMILS | SPECIAL MACHINES





Before You Buy Any Turning Equipment Check with Sundstrand *"Engineered Production"*

These are only a few of many applications of Sundstrand "Engineered Production" as applied to turning problems. Your job may be entirely different, but we invite you to investigate. Call in a Sundstrand engineer. There is no obligation for this service.

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HEAD WORK... saves time ...controls and speeds production!

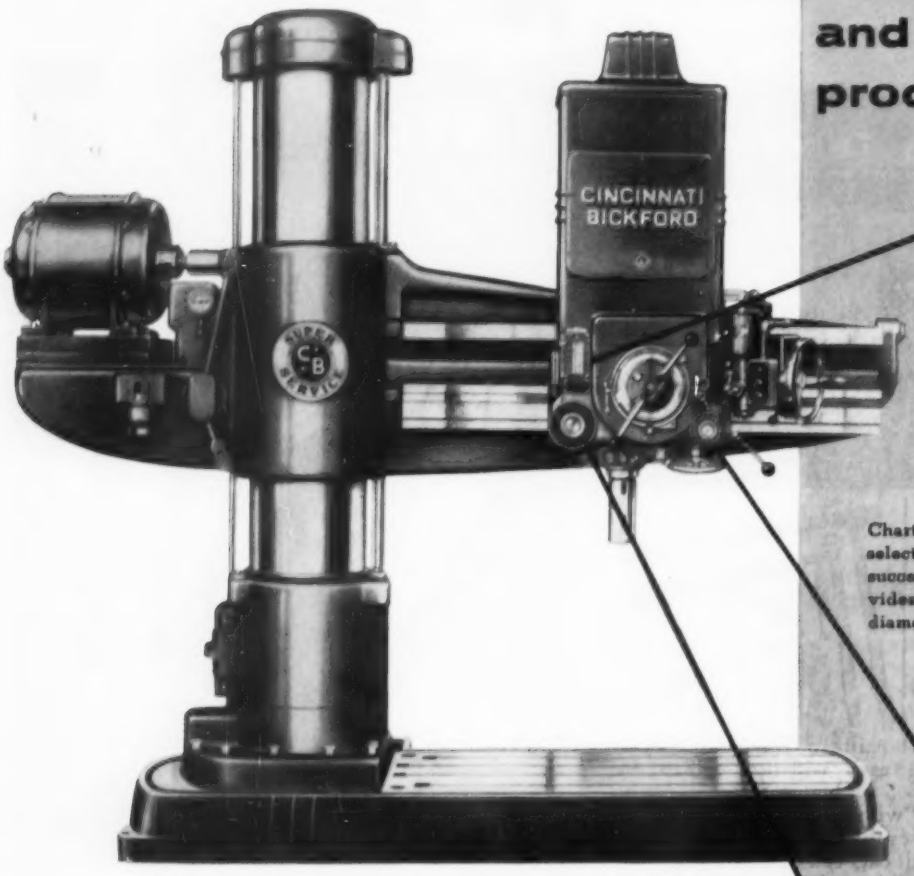
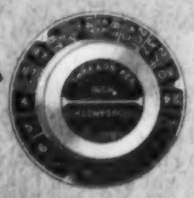
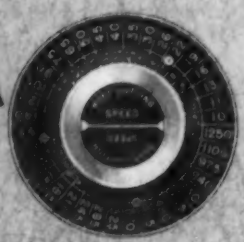


Chart guides the operator in pre-selecting speeds and feeds for succeeding operations. It provides a permanent record of tool diameter, speed and feed.



Hydraulically pre-selects all 18 feeds. Positive geared tap leads and feeds are quickly pre-set.



Hydraulically pre-selects all 36 speeds. Speeds and tool diameters are shown in large easy to read figures.

This NEW modern head gives an accelerated production and an increase in accuracy of performance ... the greatest advance in simple and positive control in Radial Drill history.

Two convenient direct reading dials control the automatic shifting of sliding gears. While the tool is cutting, merely set the dials to the speed and feed for the next operation. As the spindle is stopping for inserting the next tool, the shifting is done hydraulically ... directly, quietly and quickly. No other operations—no loss of time. Write for catalogs.

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RADIAL AND UPRIGHT DRILLING MACHINES

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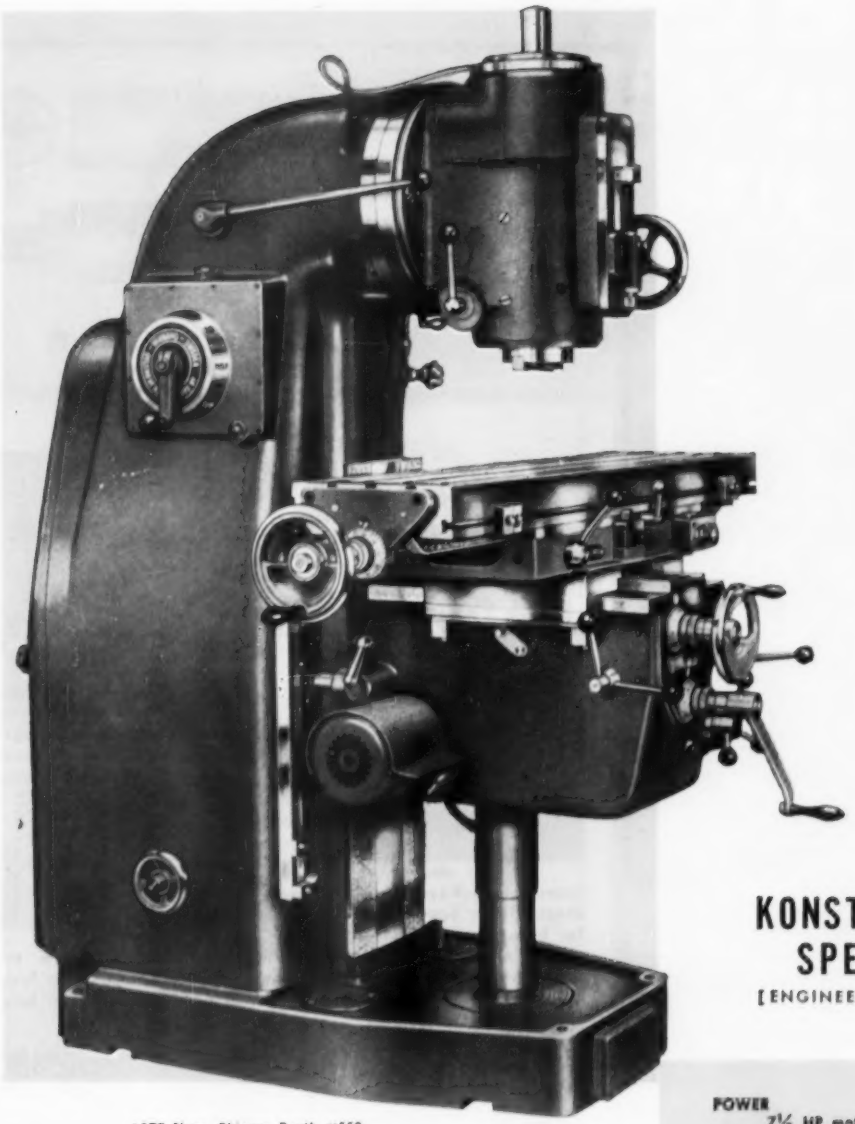
GIDDINGS & LEWIS MACHINE TOOL CO. : Fond Du Lac, Wisconsin.



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SAJO'S NEW No. 2 VERTICAL MILLER MODEL VF-54

Built to U.S. Standards by Swedish craftsmen, this precision Miller meets exacting requirements at a modest price.

SAJO Model VF-54 is an ALL GEARED Vertical Miller with hand-scraped sliding surfaces, SKF "SP" anti-friction bearings on spindle and gear shafts, hardened chrome nickel gears, ground integral splines on gear shafts, externally adjustable back-lash eliminator for table feed screws, dial-selected feeds and speeds.

POWER

7½ HP motor for spindle (5 HP optional). 1½ HP motor for table feed and 3 direction rapid traverse.

RANGE

16 spindle speeds 39-1500 RPM (31-1200 optional), No. 50NMT spindle, 12 table feeds 1⅞ to 25 inches/min. longitudinal and cross, 1⅛ to 12½inches/min. vertical. Power rapid traverse, all directions. Table travel 33½" long., 10" cross, 18" vertical.

CONTROLS

Single adjustable START-STOP-BRAKE lever. Dial selection of speeds and feeds (U.S. inch calibrated) with single lever controls. Magnetic motor starter.

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CHARACTERISTICS

High precision with instant response

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•

Accommodates widest tolerance range — .000005 to .100

•

Amplifications and tooling interchangeable

•

Provides quickest change in amplification

•

Longer scale facilitates classifying parts and provides greater approach range

•

Easier to read — no need to squat and squint

•

Human error minimized

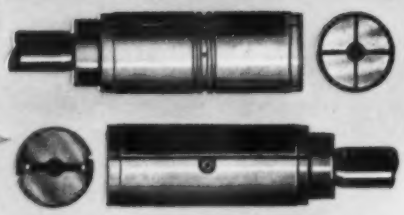
•

Checks one dimension or many simultaneously

•

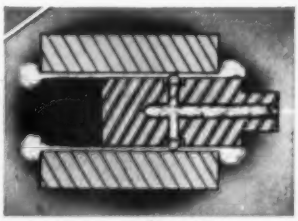
Elements have long service life

BASIC INTERNAL TOOLING ELEMENTS

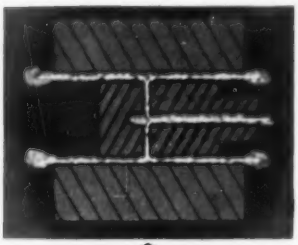


AIRJET SPINDLE

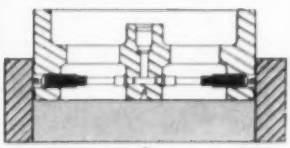
For True Diameter



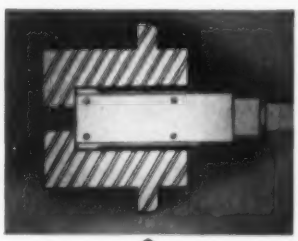
Balljet Spindles used for holes in porous or soft materials and for internal surfaces rougher than 65 rms.



Standard stock spindle with two diametrically opposed open jets for holes having tolerances of .005" or less and surface finishes of less than 65 rms.

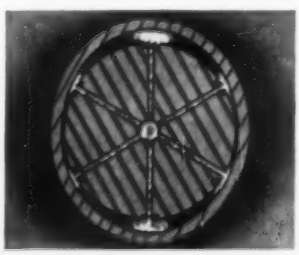


Plunjets mounted in a suitable fixture are used for larger holes and those having larger tolerances.



Bladejet Spindles are used in interrupted bores, bores having a keyway, to gage to the very bottom of a blind bore and for larger tolerance bores.

Adjustable spindles and kits are available to cover ranges of ⅜" to ⅞"; ⅞" to 1½"; 1" to 3"; 1½" to 3" and 3" to 12".



For Average Diameter

Spindles having three or more jets equally spaced around the perimeter—especially effective in checking thin wall components.

7210

MORE PRECISIONAIRES BOUGHT . . . . . .

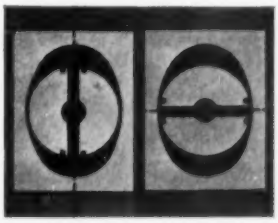
Learn About Holes*

BALLJET SPINDLE

BLADEJET SPINDLE

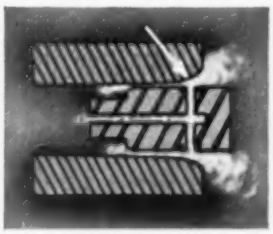
PLUNJET CARTRIDGES

For Out-of-Round



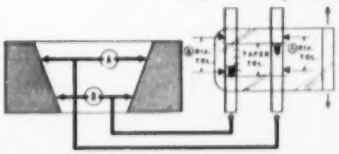
Indicated when any spindle is rotated through 90 degrees.

For Bell-Mouth



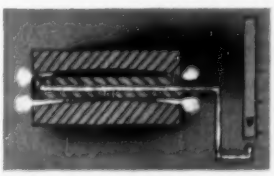
Indicated as any spindle enters or is withdrawn from the bore.

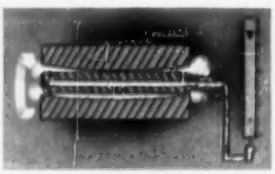
For Taper



Indicated as any spindle is passed through the bore. Spindles having two or more sets of jets may also be used. In larger bores and/or those having larger tolerances, Plunjets in a suitable fixture are used.

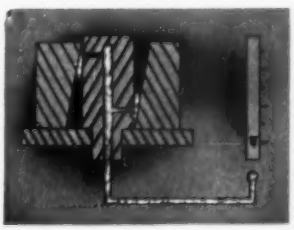
For Camber

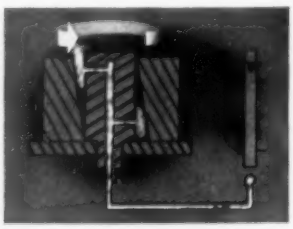


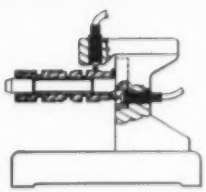


Camber or straightness of a hole is checked by rotating through 180° a spindle having four jets as indicated.

For Squareness of a Bore Axis with a Face



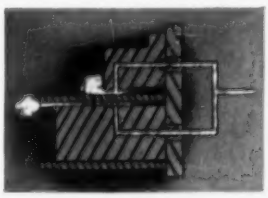




Spindle with opposed open orifices spaced longitudinally checks squareness of a bore axis with a face.

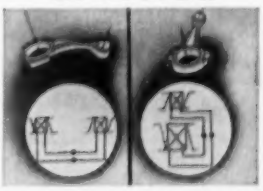
Plunjet fixtures may also be used.

For Concentricity



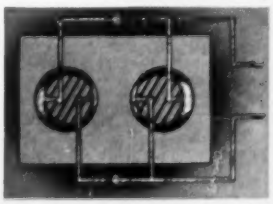
Opposed jets in a locating fixture.

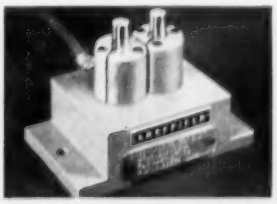
For Parallelism of Holes



By integrating two spindles in a fixture, such as those used for squareness checking.

For Center Distance Between Holes





By a fixture with two spindles each having two opposed jets.

*For checking external dimensions, relationships and countless other conditions, write to Div. 600, **THE SHEFFIELD CORPORATION, Dayton 1, Ohio, U.S.A.**

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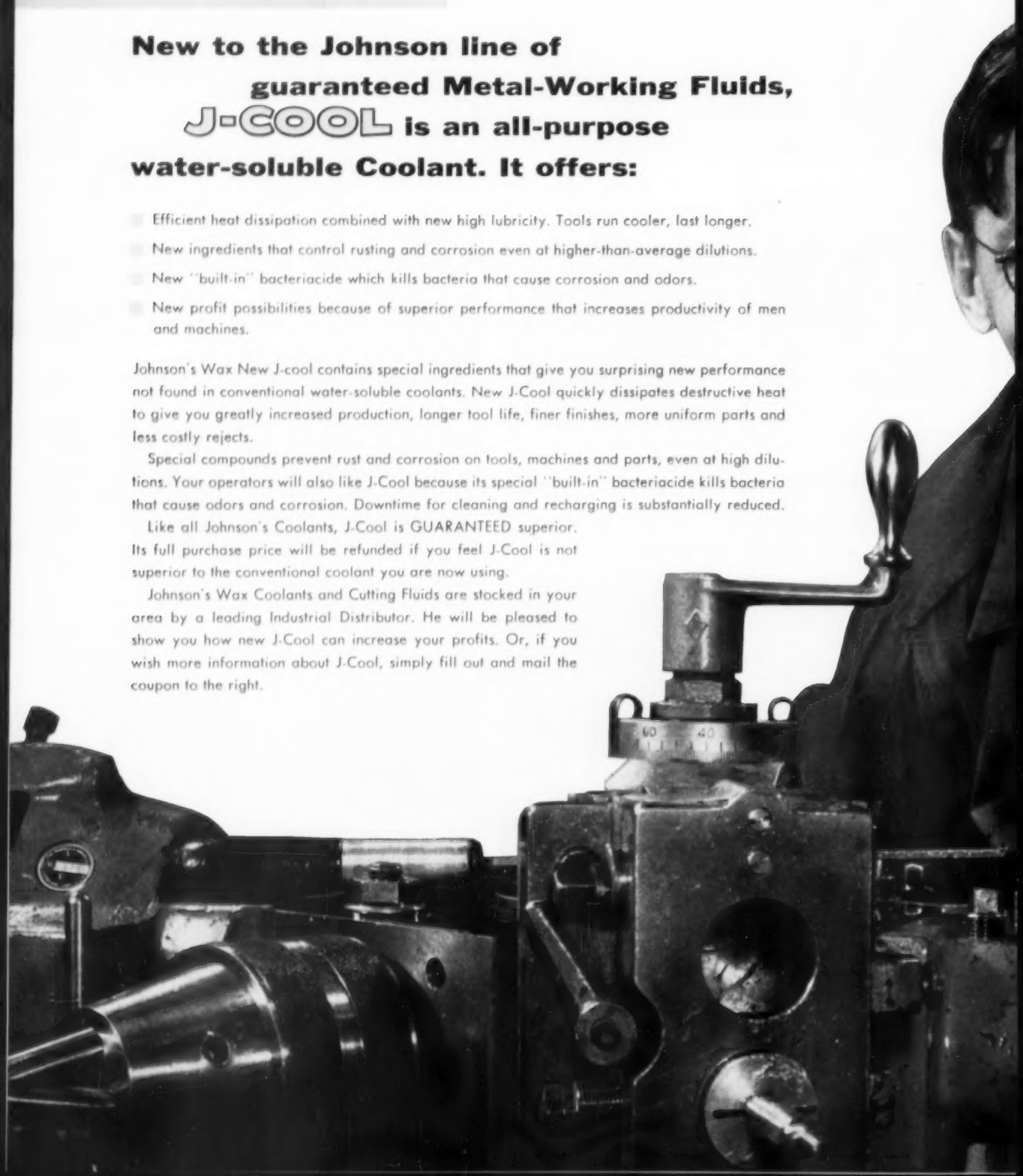

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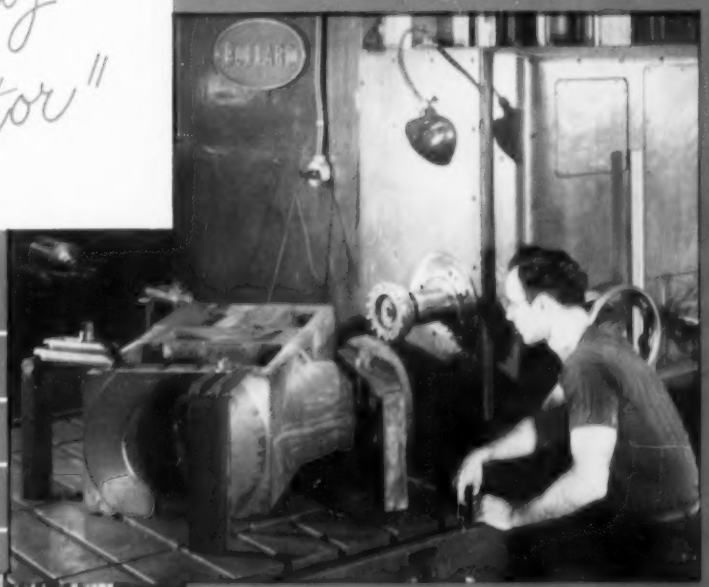

the machine is outstanding for ease of operation

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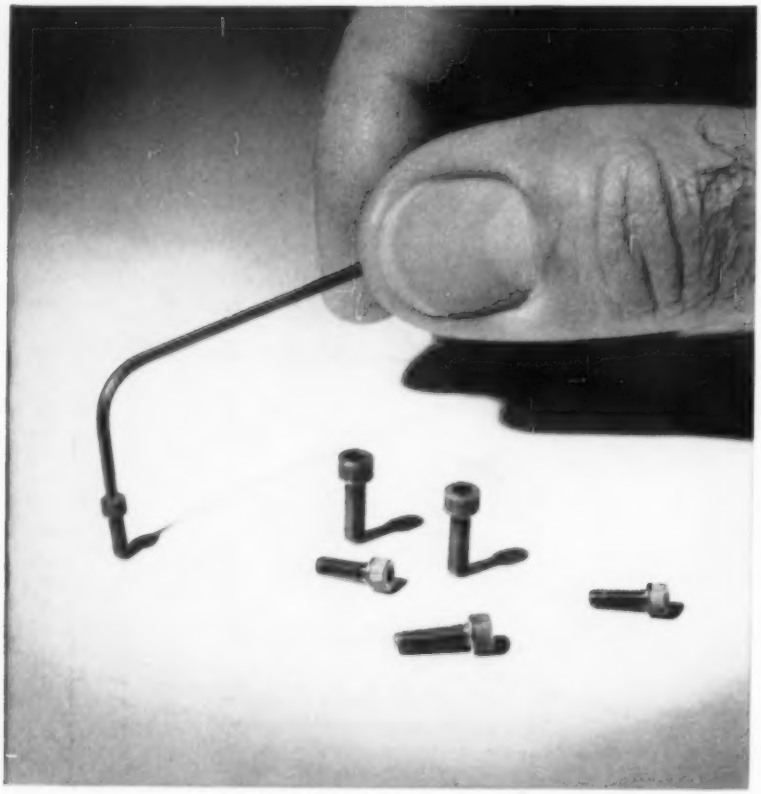
Miniature screws aid standardization of small devices



Standard UNBRAKO miniature socket head cap screws are available in sizes # 0, # 1, # 2 and # 3, in heat treated alloy steel or stainless steel, at your authorized industrial distributor's. Standard lengths range from ⅛ to ½ in.

Tiny close-tolerance Unbrako screws available in standard sizes

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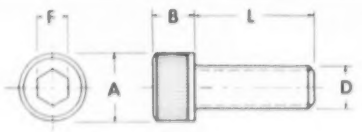

Diameter		Threads per Inch NC	Threads per Inch NF	Length	Recommended Installation Torque in Inch-Pounds NC	Recommended Installation Torque in Inch-Pounds NF	Weight per 1000 in Pounds
#0	A .104		80	⅛		2.0	.152
	B .060		80	3/16		2.0	.182
	D .060		80	¼		2.0	.210
	F .050		80	⅜		2.0	.265
#1	A .118		72	⅛	3.5	3.5	.27
	B .073		72	3/16	3.5	3.5	.32
	D .073		72	¼	3.5	3.5	.37
	F .050		72	⅜	3.5	3.5	.47
#2	A .140	56		3/16	6.0	6.0	.42
	B .086	56		¼	6.0	6.0	.50
	D .086	56		⅜	6.0	6.0	.58
	F 1/16	56		½	6.0	6.0	.70
#3	A .161	48		3/16	8.5	9.5	.59
	B .099	48		¼	8.5	9.5	.70
	D .099	48		⅜	8.5	9.5	.81
	F 3/64	48		½	8.5	9.5	1.03

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STANDARD PRESSED STEEL CO.

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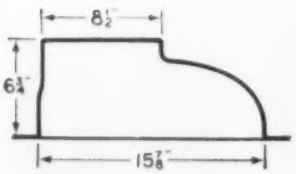
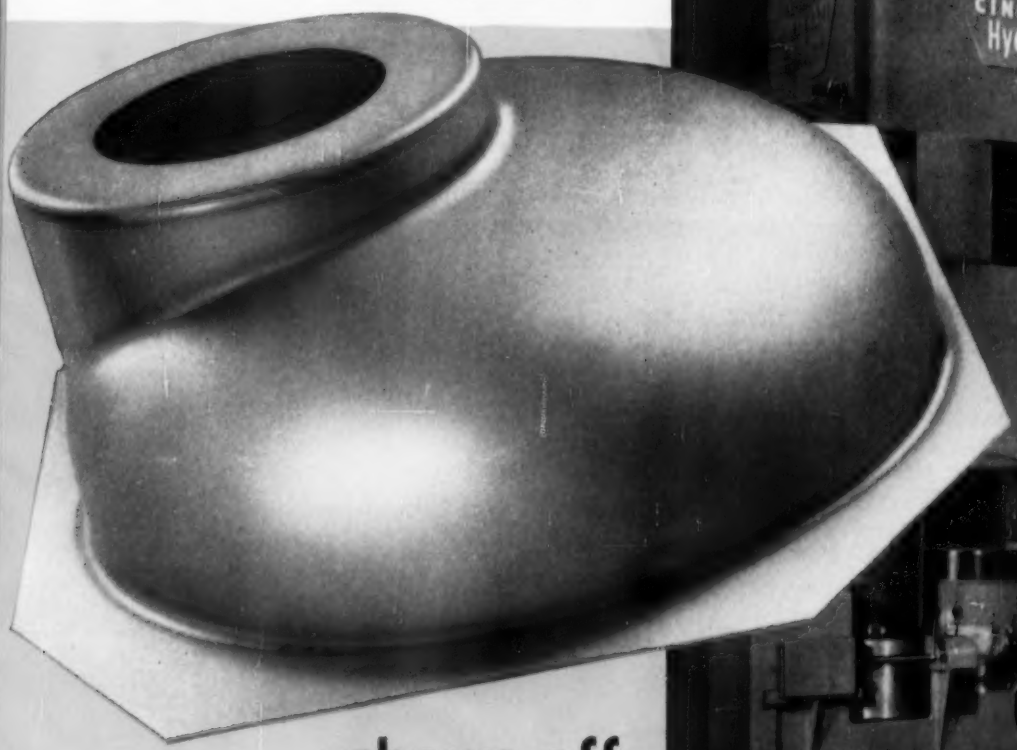
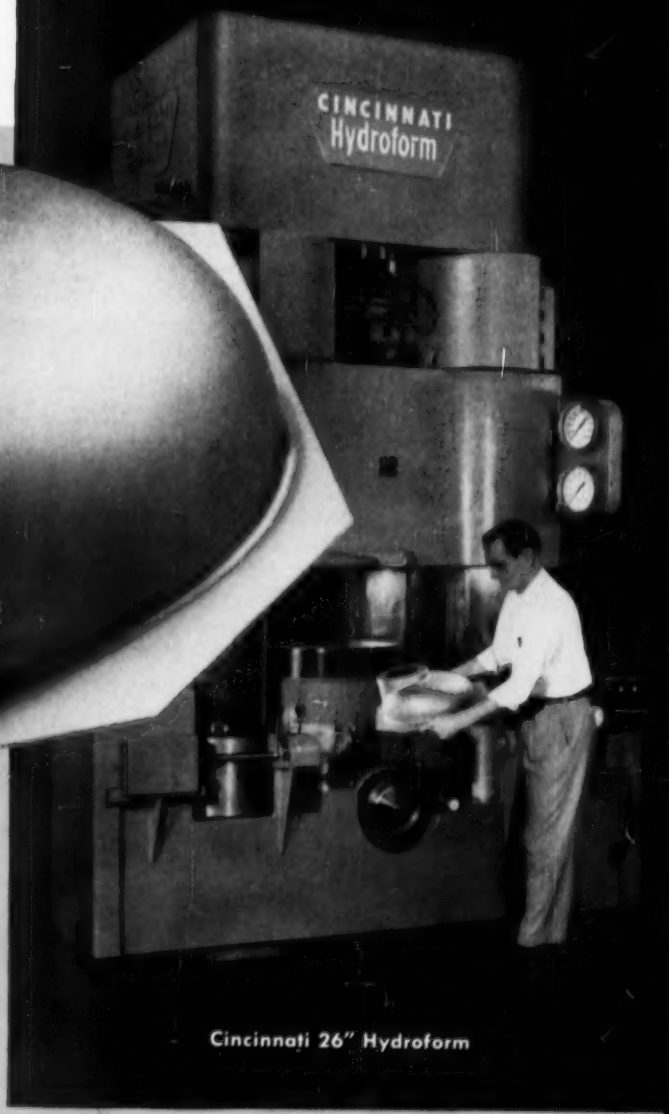
Type 302 stainless steel







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THE CINCINNATI MILLING MACHINE CO.
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Niagara Series BI Gap Frame,
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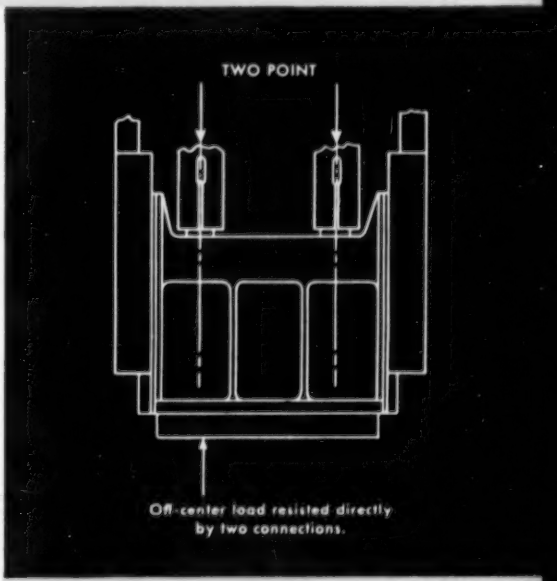
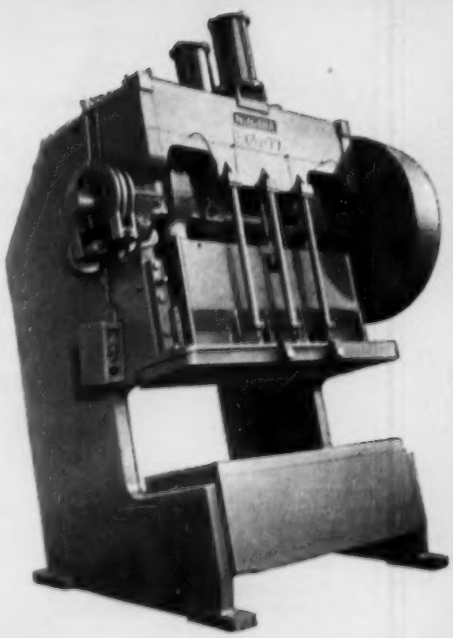


Off-center load resisted directly by two connections.



Niagara permanently inclined, gap frame, double crank press.

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. . . unsurpassed for ease of working, for safe hardening without appreciable warpage or dimensional change, for fine performance.

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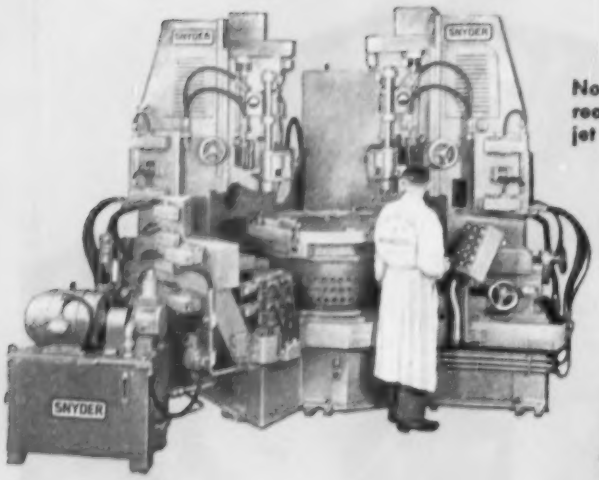
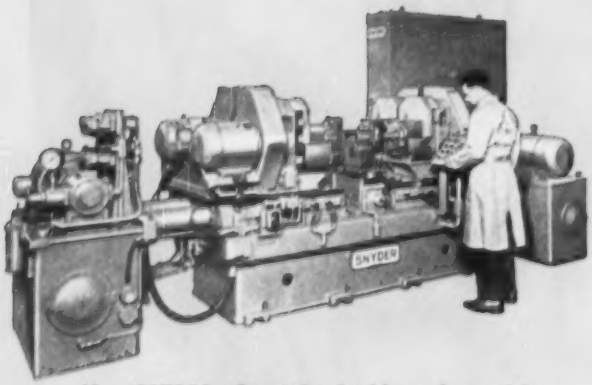
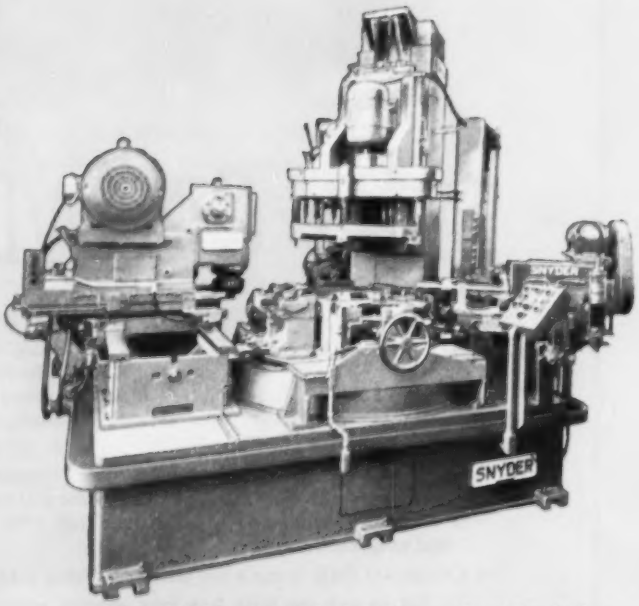


No. 70165—Special index machine to drill and ream holes in rims of outer shroud spacers for jet engines. Production 2 parts per hour.

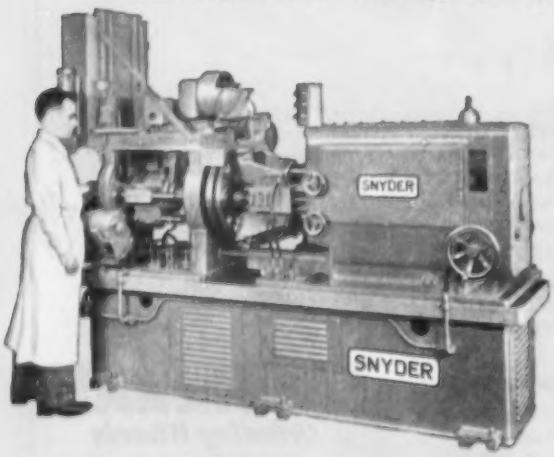
No. 65412—Special automatic machine, for weighing and precision balancing a variety of heavy-duty and diesel engine connecting rods from 7⅜" to 12" center distance. Weighs rods and automatically balance mills to plus or minus 2 grams.



No. 207390—Special, double-end precision boring machine for finish boring, counterboring and chamfering counter shaft, intermediate and shifter shaft holes on power take-off cases. Production 82 pieces per hour at 80% efficiency.



No. 73902—Special 4-station automatic index machine for milling joint face, drilling and reaming vertical and horizontal holes in exhaust manifolds. Production 80 pieces per hour at 80% efficiency.



No. 68526—Special double end trunnion machine, fully automatic, for machining special aircraft rivets. Machine is automatically loaded and unloaded. Production rate varies with size of rivet.

SNYDER VERSATILITY

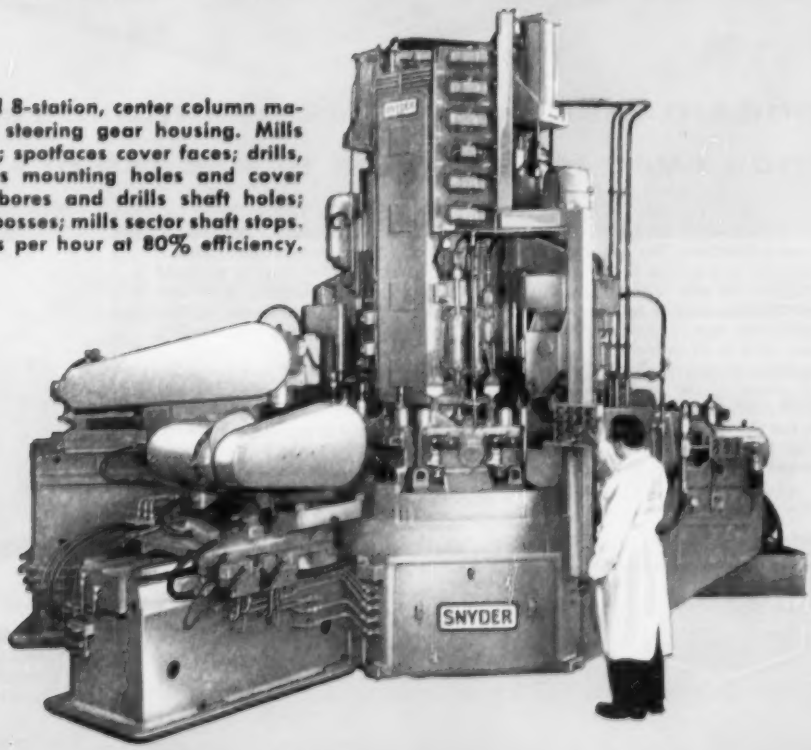
in engineering and building metal-cutting machines includes not only the great Snyder line transfer machines with automation, but also many smaller and diversified machines in which the standards of performance and economy are no less exacting. A few representative examples are shown.

SNYDER

TOOL & ENGINEERING COMPANY

3400 E. LAFAYETTE • DETROIT 7, MICHIGAN

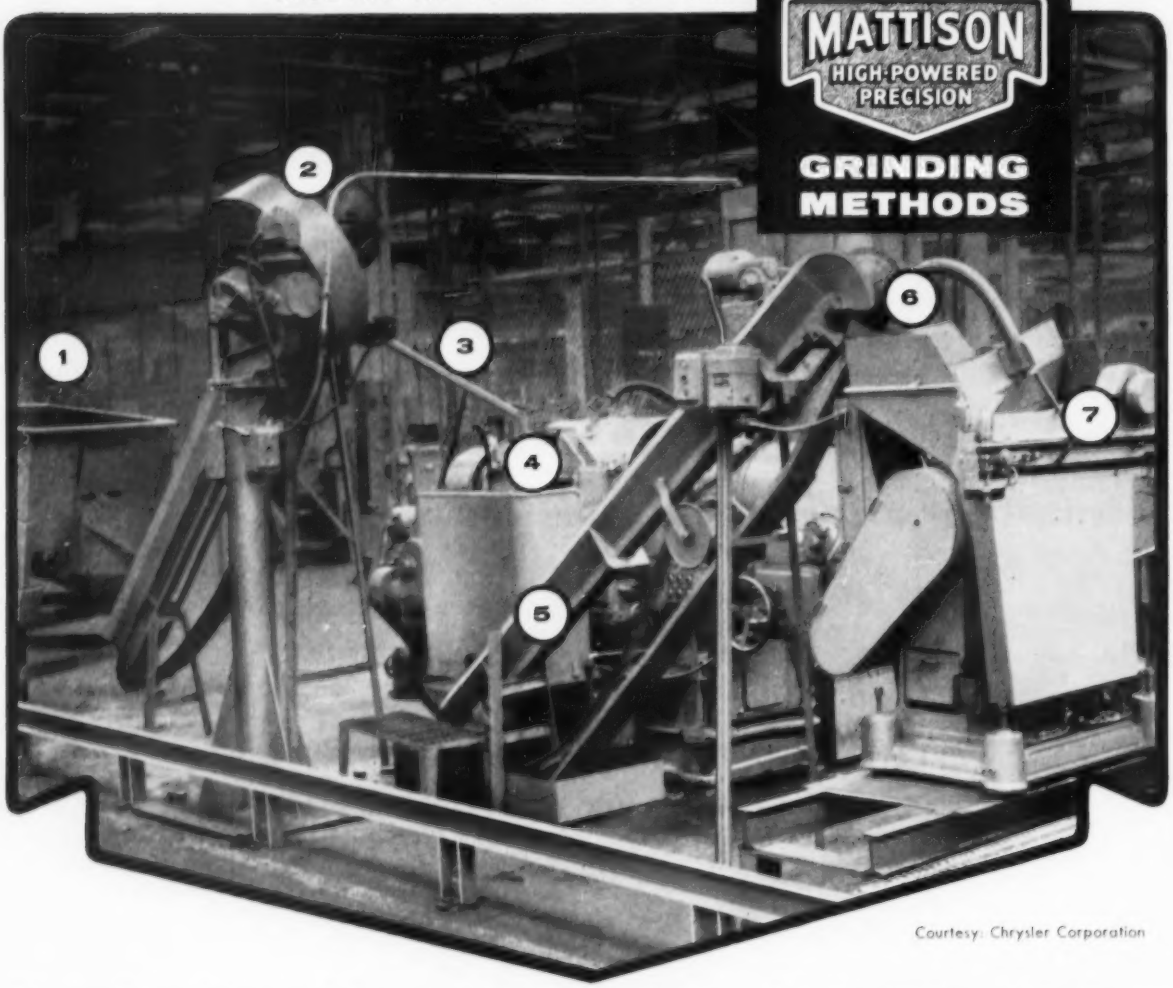
31 Years of Special Machine Tools with Automation



No. 72976½—Special 8-station, center column machine for processing steering gear housing. Mills pads and cover faces; spotfaces cover faces; drills, countersinks and taps mounting holes and cover holes; rough counterbores and drills shaft holes; mills two Welch plug bosses; mills sector shaft stops. Production 260 pieces per hour at 80% efficiency.

CASE HISTORY NO. 16—PISTON PINS

MATTISON
HIGH-POWERED PRECISION
GRINDING METHODS



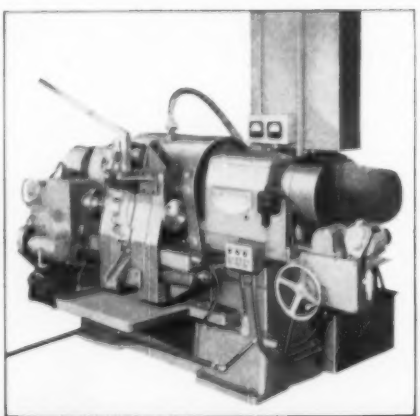
Courtesy: Chrysler Corporation

Standard machine meets automatic requirements... grinds two sides of pins in excess of 1300 per hour!

Chrysler Corporation's New Castle, Ind. plant uses a Mattison No. 221 Double Disc Grinder to machine both ends of piston pins for six and eight cylinder engines for Chrysler-made cars and trucks at a production rate of more than 1300 per hour with a 20 micro inch finish. The machine produces at a rate that keeps it ahead of the production line. Automatic loading and sizing make it possible to run the machine with minimum attention by the operator. Tolerances are always well within specifications.

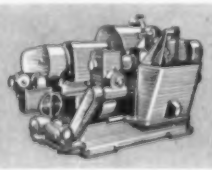
Operation of the grinder can be traced according to the numbers on the photo: 1) loading hopper for pins; 2) stacking drum; 3) channel carrying pins into grinder; 4) grinding station; 5) belt conveyor to next station; 6) loading hopper for next operation; 7) conveyor to centerless grinders for finishing o. d.

Stock removal remains constant because of the automatic equalization feature of the machine. These versatile double disc grinders may be the answer to your machining problem, too!



This double disc grinder produces more piston pins than the engine line can use with minimum supervision.

MATTISON
MACHINE WORKS
ROCKFORD ILL. U.S.A.



HIGH-POWERED
PRECISION
SURFACE
GRINDERS

LEAD is the distance a screw thread advances axially in one turn. It is measured in terms of a linear inch, the tolerance on a ground thread tap being ±.0005" in one inch of thread.

Slight lead error causes threads to bind when assembled, excessive error prevents assembly. Since taps transmit their own errors to the threaded product, the importance of controlling tap lead is clear.

So, these nameless taps though closely controlled at every prior operation must, before they earn the right to bear the trade-mark GTD, pass this last test, for lead.

IF IT CAN BE MEASURED **GREENFIELD** *MEASURES IT*

GREENFIELD TAP and DIE CORP.
GREENFIELD, MASS.

J. B. Rustic, General Superintendent, Operating Department, American District Telegraph Company, tells how:

"We stopped 2,000 burglars last year!"

"Stone walls, iron bars, squads of guards — nothing protects money and property like our burglar alarm service — in co-operation with the police, of course.

"Every year, ADT Protection Service saves subscribers hundreds of thousands of dollars by automatically detecting burglaries, fires, and other dangerous conditions.

"Our systems have to work — all the time. And they do, thanks to constant supervision, proper maintenance — and to Air Express!

"For if new parts are needed, Air Express delivers for us anywhere in the country in a matter of hours!

"Yet, we actually save money with Air Express. A typical 20-pound shipment goes from New York to St. Louis for $7.48. That's $3.17 less than any other complete air service!"

Air Express

GETS THERE FIRST *via U.S. Scheduled Airlines*

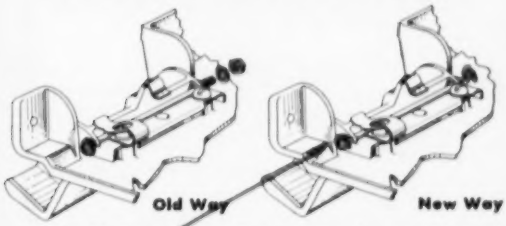
CALL AIR EXPRESS . . . *division of* RAILWAY EXPRESS AGENCY

5 Waldes Truarc rings eliminate parts, speed assembly, in light, compact dictating machine

Edison's "V. P." Voicewriter

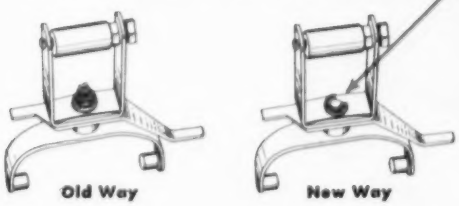
Edison engineers built this new dictating instrument for small size, light weight, and rugged performance. Waldes Truarc rings replace old fashioned fasteners, cut production costs; keep unit light, compact, and achieve faster more economical assembly.

Disc Lever Cover Assembly



Two Waldes Truarc E-Rings (Series 5133) replace nut, bolt, washer assembly, eliminate one component and assure precise alignment of parts. Truarc rings facilitate pivoting without binding. Production assembly time is decreased.

Lift Bracket and Fork Assembly



A single, easily assembled Waldes Truarc E-Ring (Series 5133) replaces nut-bolt-washer fastening. Free pivoting is assured, one component eliminated, labor and material costs reduced.

Clutch Plate Assembly

Two Truarc E-Rings eliminate staking operation, prevent damage to spring coil. Simple assembly operation speeds production, eliminates rejects, reduces labor and material costs.

Whatever you make, there's a Waldes Truarc Retaining Ring designed to improve your product... to save you material, machining and labor costs. They're quick and easy to assemble, and they do a better job of holding parts together. Truarc rings are precision engineered and precision made, quality controlled from raw material to finished ring.

36 functionally different types... as many as 97 different sizes within a type... 5 metal specifications and 14 different finishes. Truarc rings are available from 90 stocking points throughout the U. S. A. and Canada.

More than 30 engineering-minded factory representatives and 700 field men are available to you on call. Send us your blueprints today. Let our Truarc engineers help you solve design, assembly and production problems, without obligation.

For precision internal grooving and undercutting... Waldes Truarc Grooving Tool!

WALDES
TRUARC®
RETAINING RINGS

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Waldes Kohinoor, Inc., 47-16 Austel Place, L. I. C. 1, N. Y.
Please send the new supplement No. 1 which brings Truarc Catalog RR 9-52 up to date.
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City.....Zone.....State.....

AM-613

WALDES TRUARC Retaining Rings, Grooving Tools, Pliers, Applicators and Dispensers are protected by one or more of the following U. S. Patents: 2,382,948; 2,411,426; 2,411,761; 2,416,852; 2,420,921; 2,428,341; 2,439,785; 2,441,846; 2,455,165; 2,483,379; 2,483,380; 2,483,383; 2,487,802; 2,487,803; 2,491,306; 2,491,310; 2,509,081; 2,544,631; 2,546,616; 2,547,263; 2,558,704; 2,574,034; 2,577,319; 2,595,787, and other U. S. Patents pending. Equal patent protection established in foreign countries.

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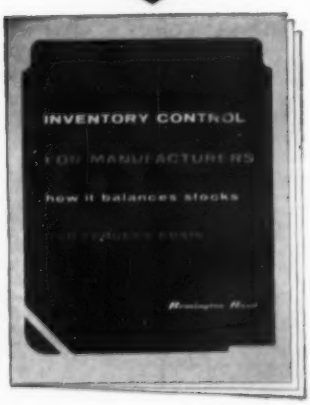
INVENTORY CONTROL FOR MANUFACTURERS

How It Balances Stocks And Reduces Costs



THIS NEW comprehensive, illustrated booklet, "Inventory Control For Manufacturers," is filled with the most effective, modern techniques for balancing stocks and reducing costs.

Inventory represents about one-third of the capital invested in manufacturing and usually is the largest item on the balance sheet outside of plant and equipment. OVERSTOCKS result in increased investment, useless tying up of capital, increased insurance, the use of more floor space for storage purposes, deterioration and obsolescence, and other substantial losses. UNDERSTOCKS result in lost sales, extra expense of "rush" orders and last minute buying, and idle shop time waiting for short and undelivered material.

Don't miss this opportunity to get the full picture of what Inventory Control means to Management, Production, Purchasing and Sales. Upon inventory availability and adequacy depend scheduling, workflow and delivery – even such human factors as job stability and good labor relations. Inventory Control is the backbone of all manufacturing operations.

No two plants have the same problems but the principles of a good inventory control record as outlined in this booklet, may be profitably adapted and applied to the needs of any business.

Write today for this new booklet. Ask for KD406—"Inventory Control For Manufacturers . . . How It Balances Stocks and Reduces Costs." Remington Rand, Room 1370, 315 Fourth Avenue, New York 10.

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When the work calls for carbide cutting tools — tipped or solid — you can count on Union to supply them. The right grade of carbide will have been carefully selected to serve your exact purpose on the material you wish to machine.

Specify Quality Union Tools for all your cutting needs.

Write on your company letterhead for our new Carbide Tool Catalog. Address Dept. B

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ATHOL • MASSACHUSETTS

Owners and Operators of: **S. W. CARD COMPANY DIVISION, Mansfield, Mass.**
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UNCOVER THE HIDDEN PROFITS IN

with U. S. AUTOMATIC PRESS ROOM EQUIPMENT

on Display at Booth 375

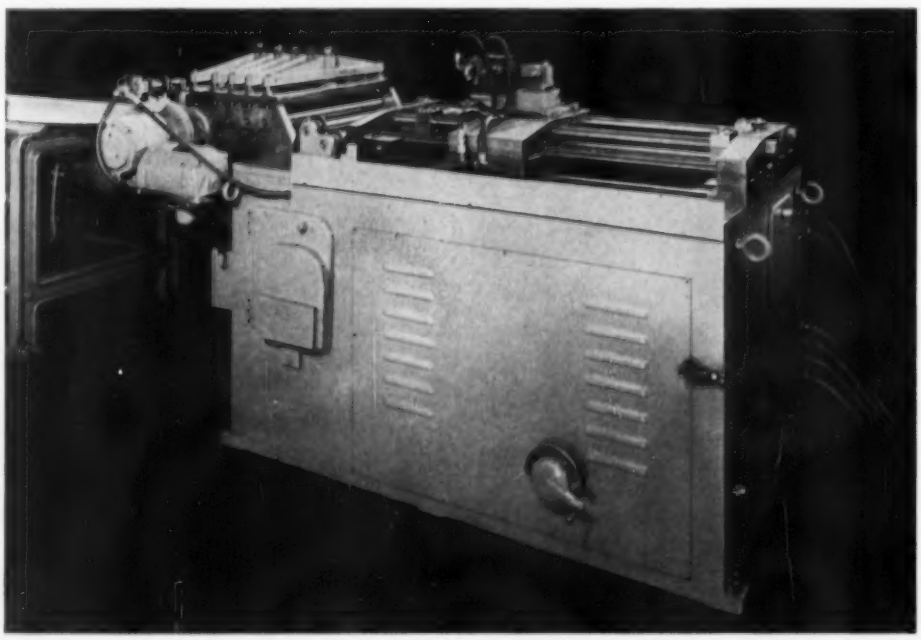
TOOL ENGINEERS INDUSTRIAL EXPOSITION

By converting your presses into automatic machines you are able to reduce piece part costs. You, like all other manufacturers, are interested in attaining this end result. The units illustrated are only a few of the different types of Feeds, Straighteners, Coil Cradles and Stock Reels included in our line. These and our other units have been designed and built with the end result of "Automatic Operation" in mind.

To keep pace with the requirements of stamping manufacturers, we will exhibit and demonstrate a number of completely new units in our Press Room Equipment line at the ASTE Industrial Exposition, International Amphitheatre, Chicago, Illinois, March 19-23, 1956.

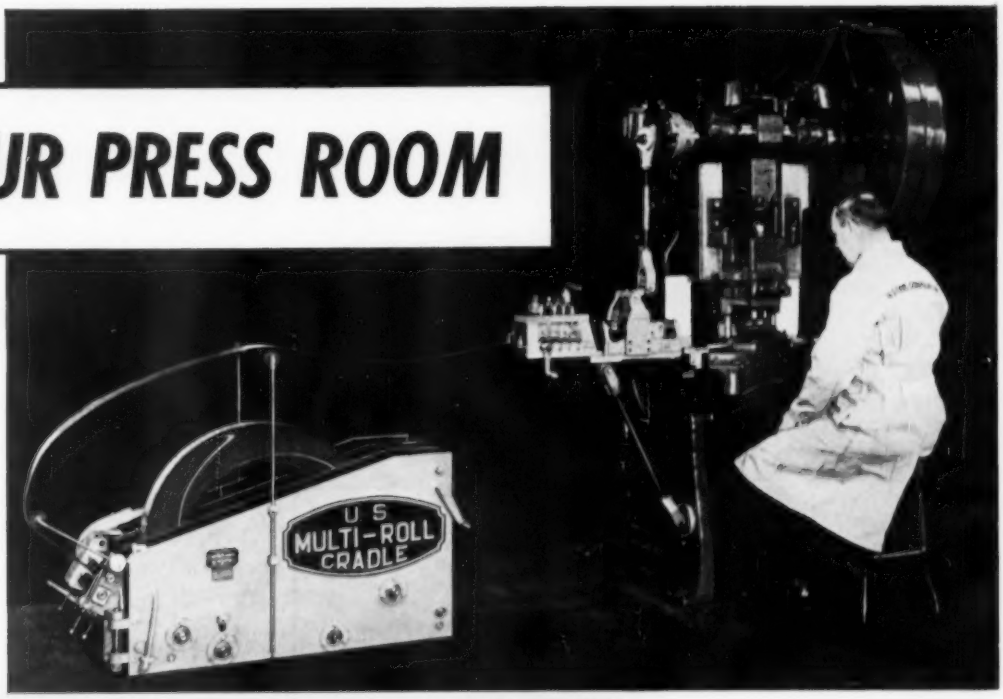
The use of this equipment gives you the double advantage of increased production and reduced labor costs, plus the feature of flexibility. Within their capacity, U. S. Slide Feeds can be easily adapted to handle materials varying in width, thickness and length of feed. Furthermore, U. S. Slide Feeds are designed so that the length of feed is controlled between positive stops providing consistent accuracy that is especially desirable in progressive die operations.

If you use presses in your production program, be sure to visit our Booth No. 375 at the Exposition. In the meantime, ask for a copy of our Bulletins No. 80-A and 90-A illustrating and describing U. S. Automatic Press Room Equipment.

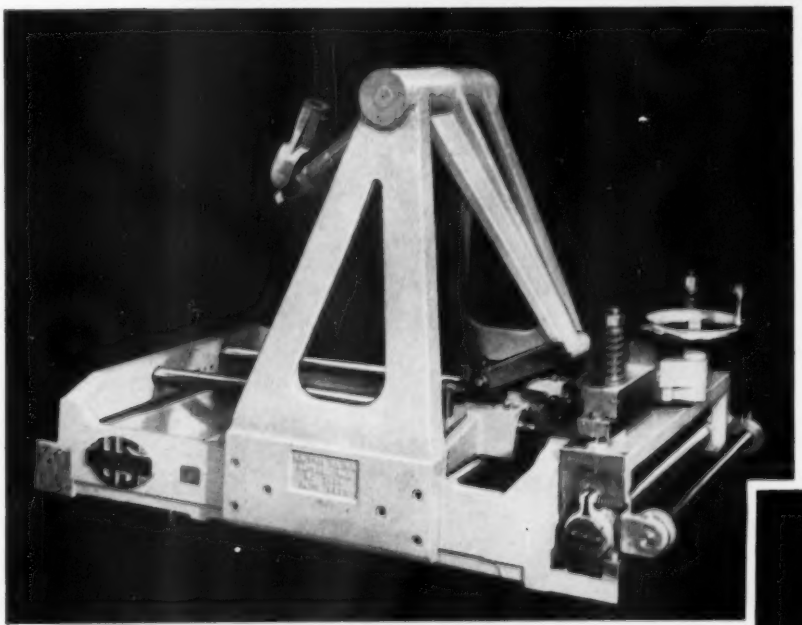


SFC-24-24 U. S. Cabinet Mounted Individually Motor Driven Slide Feed capable of handling material up to 24 inches in width, with feed length adjustable up to a maximum of 24 inches at one stroke. Equipped with Stock Straightener with a pair of motor driven take-in rolls suitable for material up to .060 in thickness. This feed can be cycled to obtain feed lengths over 24 inches.

YOUR PRESS ROOM



U. S. Slide Feed, Plain Straightener, and U. S. Multi-Roll Cradle used in conjunction with conventional O.B.I. Press.



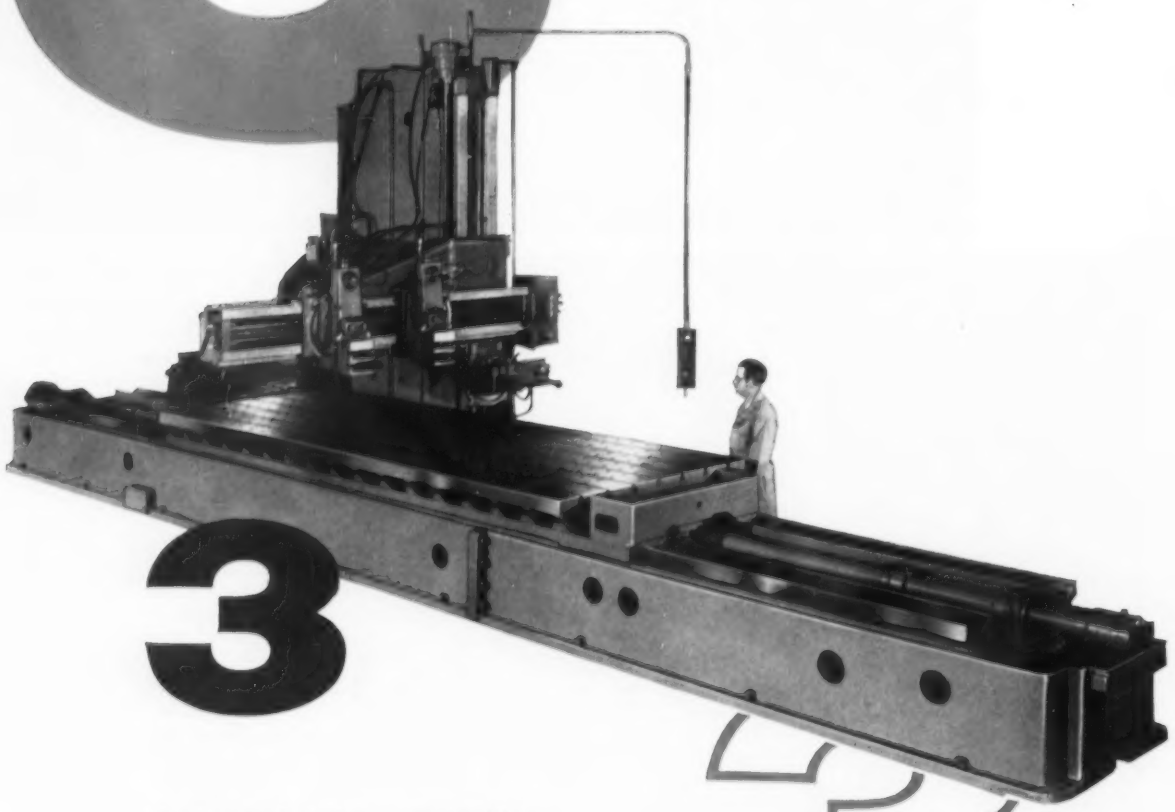
Smallest and largest sizes of U. S. Slide Feeds which we now build. Above, Model SF-24-24 capable of handling material up to 24 inches in width, with feed length adjustable up to a maximum of 24 inches. To the right, Model SF-00 capable of handling material up to 1½ inches in width with feed length adjustable up to a maximum of 1 inch.

U. S. TOOL COMPANY, Inc.

AMPERE (EAST ORANGE) NEW JERSEY

Builders of U. S. Multi-Slides—U. S. Multi-Millers—U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

3 planers in one machine



Pendant control of range and cutting speed selection.

Maximum return speed regardless of cutting speed.

Quick reversals with minimum overtravel.

with hydraulic triple circuit

h3 drive

low speeds to 100 fpm. with force for heavy cuts
medium speeds to 150 fpm. with force for normal cuts
high speeds to 300 fpm. with force for light cuts

H3 drive is an exclusive new feature on Rockford Hydraulic Planers. In the three speed circuit, a double acting cylinder opposed by a single acting cylinder are employed, giving three speed ranges with the power inversely proportional. The hydraulic triple circuit provides the correct speed and force—in one machine—to most economically machine every type of metal. Ask a Rockford Machine Tool Co. representative for further information, or write direct.

ROCKFORD MACHINE TOOL CO.
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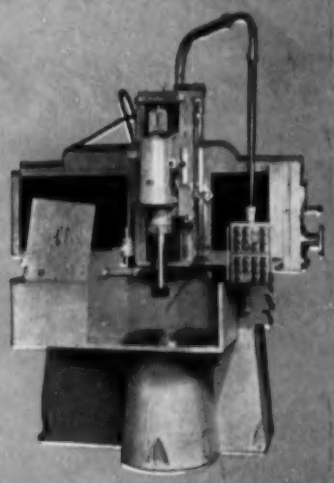
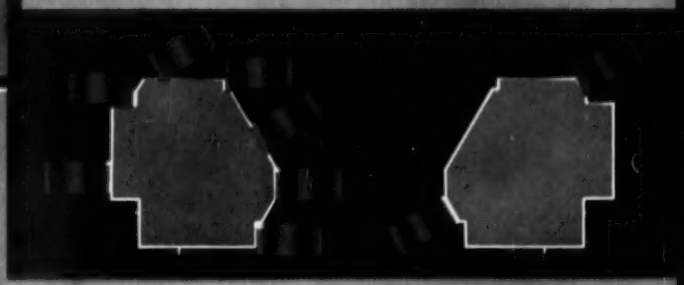
h3 drive





one setup: nine jobs

As flexible, as responsive as a dentist's drill, a Springfield Vertical Universal Grinder can reach around and into a workpiece to do nine different jobs on one chucking.

If you make a pipeline valve, a mold, a bearing race—requiring micro-inch finish on any or all the faces shown in the diagram—at whatever angle—look into Springfield. These grinders cut down the number of set-ups, frequently eliminate hand-lapping, operate with fewer work-holding devices. And, as a bonus, on jobs calling for extreme concentricity, one angle setting of the Springfield head grinds both faces of mating parts.

All three models readily adaptable to special problems.

Vertical Universal Grinders: swings 18", 24" and 42".

Lathes: Engine and tool room, contouring and reproducing—swings 14" to 32".

The Springfield Machine Tool Company
Springfield, Ohio

65TH YEAR OF BUILDING IDEAS INTO MACHINE TOOLS

SPRINGFIELD

Announcing...

. . . THE ADDITION OF PRECISION END MILLS TO THE ECLIPSE COUNTERBORE CUTTING TOOL LINE with the acquisition of WADELL TOOLS of North Branch, New Jersey!

These end mills, widely acclaimed in the industry, are unique in that their flutes and lands are ground in one continuous operation from solid hardened blanks. This insures identical dimensions throughout and eccentric relief rather than ground "back off". The cross-section affords maximum web strength and ideal rake contour.

Our proven precision automatic flute grinding method produces end mills giving superior performance which means longer life, finer finish and lower production costs.

For over 40 years Eclipse has specialized in hi-quality cutting tools; interchangeable carbide and high speed counterbores, countersinks, core drills and back-spotfacers. NOW precision end mills augment the ECLIPSE line making available another Eclipse tool in fields heretofore not serviced.

SEE THIS REMARKABLE NEW LINE AT THE

Booth 1121

A.S.T.E. INDUSTRIAL EXPOSITION and CONVENTION

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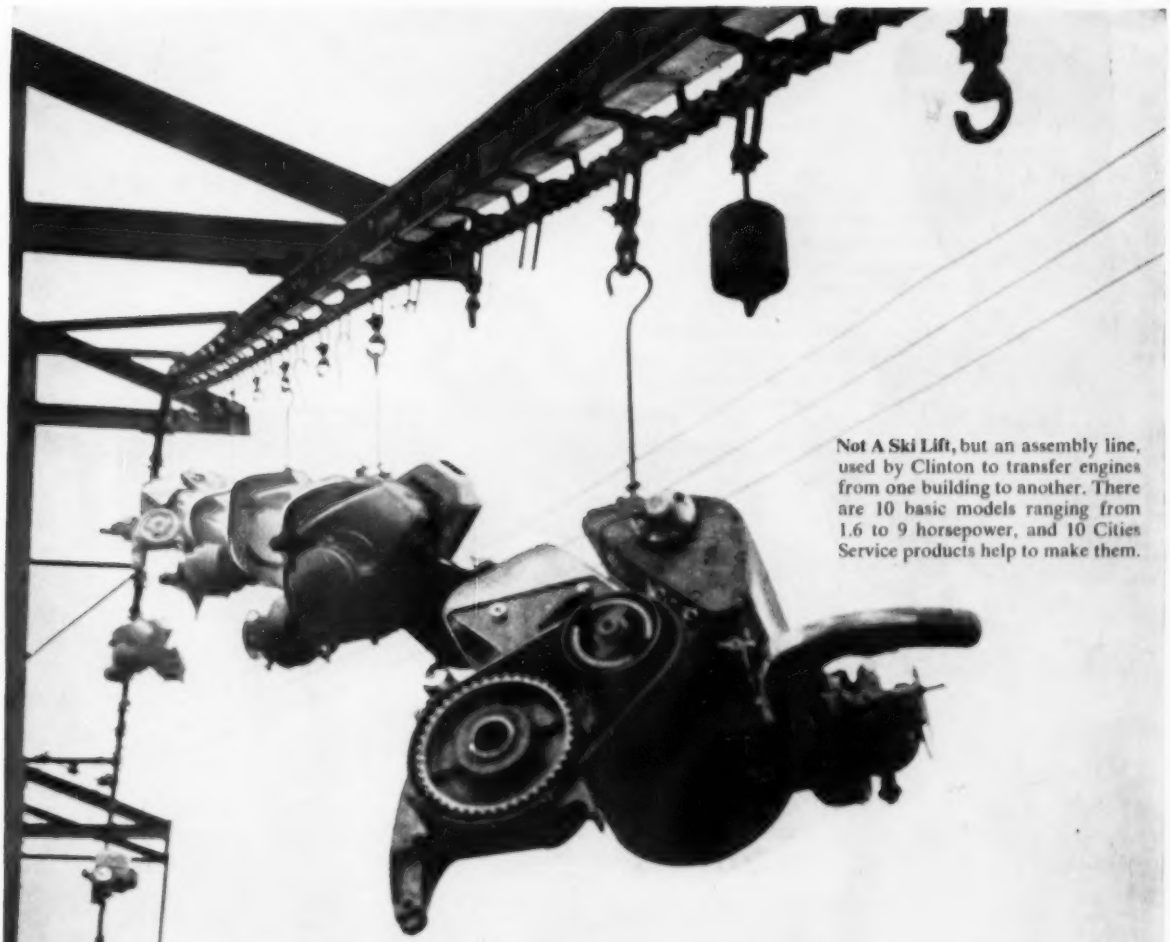
ECLIPSE COUNTERBORE COMPANY

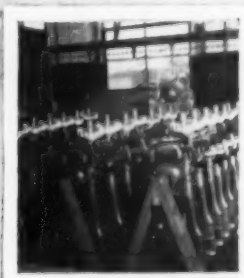
1600 BONNER AVE., DETROIT 20, MICHIGAN

END MILL DIVISION—NORTH BRANCH, N. J. (ADDRESS BOX 97, RARITAN, N. J.)



Not A Ski Lift, but an assembly line, used by Clinton to transfer engines from one building to another. There are 10 basic models ranging from 1.6 to 9 horsepower, and 10 Cities Service products help to make them.

"3,000,000 ENGINES IN EIGHT YEARS... CITIES SERVICE PLAYED MAJOR ROLE."



Outboard Motors are one of the chief products of Clinton Machine Company. Others include chainsaws and many types of gasolene engines for small power requirements.

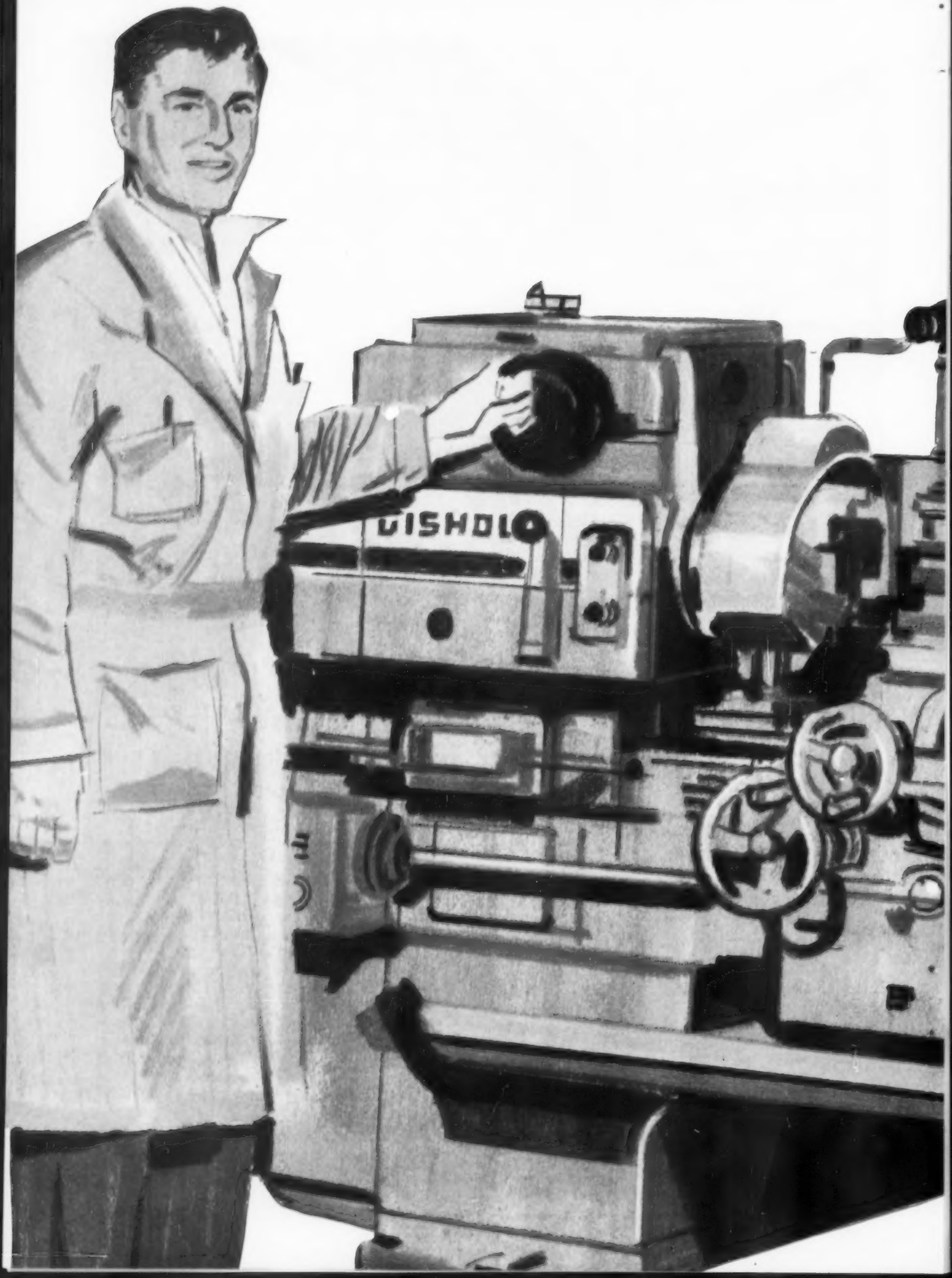
Phenomenal is the word for Clinton Machine Company, Clinton, Michigan. Formed in 1946, it has expanded so rapidly that today it claims second place among U.S. producers of air-cooled gasolene engines and has already marketed 3,000,000 of these and other engines.

Were there lubrication problems? Of course. "But," says President Don Thomas, "I am happy to say they have continually been taken care of by Cities Service from the very beginning. In these formative years, Cities Service engineers came to our plants and recommended the proper lubricants for both our production machinery and the products we make. Thus, for the past eight years, we've used Cities Service Chillo Cutting Oils, Trojan Greases and Pacemaker Oils with complete satisfaction. We don't hesitate to say that the cooperation and outstanding service offered by Cities Service plus the quality of its products has played a major role in helping us build the Clinton Machine Company."

Time and again manufacturers like Clinton report unusual results using Cities Service Lubricants. Find out why. *You* may profit, too. Talk with your local Cities Service Lubrication Engineer or write: Cities Service Oil Company, Sixty Wall Tower, New York 5, N. Y.

CITIES SERVICE

QUALITY PETROLEUM PRODUCTS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GISHOLT MASTERLINE
RAM TYPE TURRET LATHE

MASTERLINE
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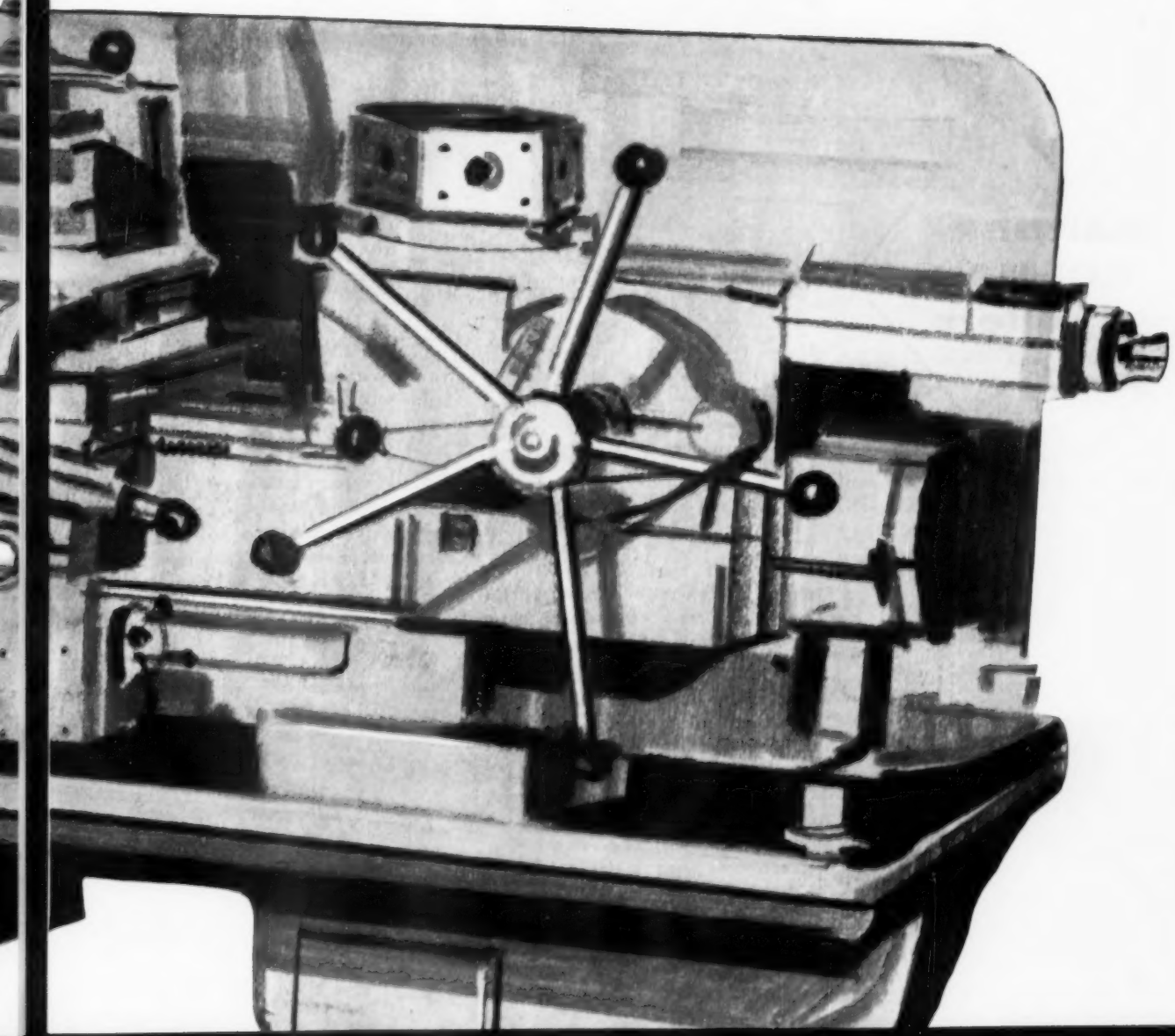
1887

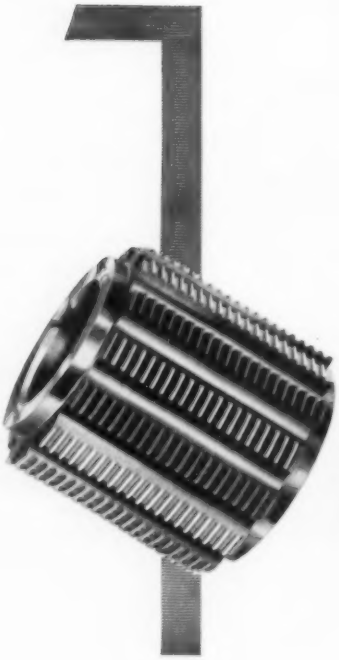
Here is the latest Gisholt MASTERLINE Ram Type Turret Lathe, with many improvements and outstanding features to provide faster, easier operation, higher quality, quicker setup and lower maintenance. In short, it is designed to do your work faster, cheaper and better—and with a new minimum requirement for operator skill, attention and effort. Let us tell you more about these new machines, and discuss the possibilities of their profitable application to your particular manufacturing processes

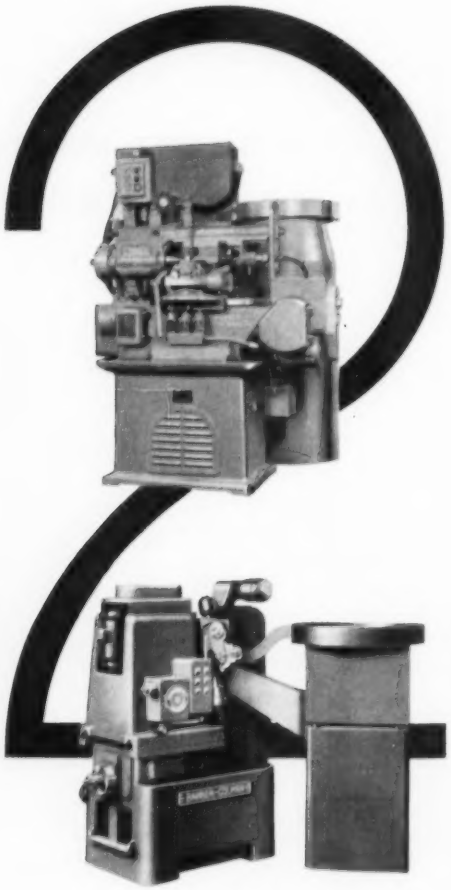
Gisholt Machine Company, Madison 10, Wisconsin

Look ahead—keep ahead—with Gisholt



it takes top equipment to cut the best gears





BARBER-COLMAN offers

Superior Hob Accuracy

As a result of long experience and skill in hob manufacture, Barber-Colman offers a new concept of ultra-precision in hob tolerances. An example is a 48 DP Class AA hob, ground to total allowable lead variation of .00015" tooth-to-tooth, .00015" in any one axial pitch, and .0003" in three axial pitches. Tolerances such as these are only practical where machine and hob sharpening have equally close tolerances. We suggest you contact our engineers for recommendations when you have jobs requiring hobs of this accuracy.

For production hobbing, Barber-Colman makes Class A, Class B and Class C hobs. Classes A and B are ground on the form and are recommended for accurate finishing and semi-finishing. Class C Accurate Unground hobs are used primarily on preshaved gears. All hobs are well within the standard tolerances for their particular class and pitch.

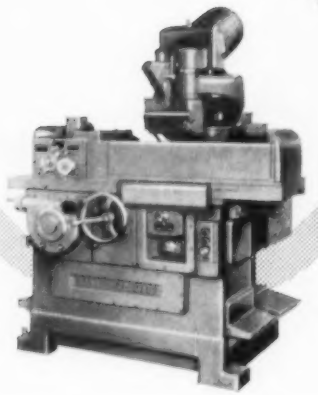
Automated Gear Production

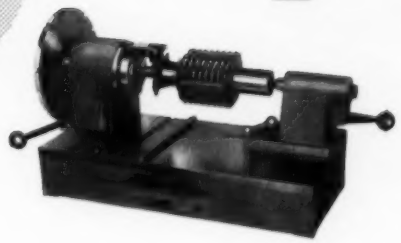
For high speed, mass-production gear problems, Barber-Colman engineers have developed fully automatic hobbing machines, including magazine or hopper-feed loading, fully automatic cycle and automatic hob shifting.

For maximum production of specific parts, machines are designed with special purpose tooling, loading, gaging and handling to suit the requirements for accuracy and finish. Such machines may also include inspection, rejection, and size-gaging as part of the automatic cycle.

General purpose hobbing machines are available for hobbing parts up to 16" diameter, from 3½ DP to the finest pitches. A variety of special tooling can be furnished — hydraulic, pneumatic, electric — to give maximum accuracy and production efficiency for the particular problem.

345





Controlled Hob Sharpening

The inherent accuracy in Barber-Colman hobs and hobbing machines may be upset if all factors are not in adjustment. A common cause for loss of accuracy is error in resharpening hobs. To provide positive sharpening control on a production basis, and to insure maximum accuracy in sharpening, Barber-Colman engineers have developed a series of automatic sharpening machines. With these machines the sharpening operation becomes simple, fast and convenient, and original tool accuracy is easy to maintain.

Hob Sharpening Inspection

The Barber-Colman Hob Sharpening Checker is a precision instrument for measuring the accuracy of face sharpening on straight and helical fluted hobs. The precision found in Barber-Colman hobs is inherent and the only place it can be lost is in the sharpening operation. Reasonable in cost, this checker furnishes a convenient method for checking the sharpening accuracy.

Gear Cutting Service

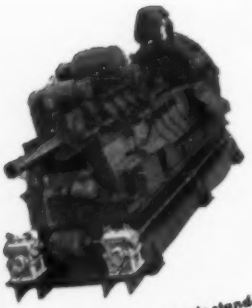
Barber-Colman hobbing engineers, backed by years of experience in the field, and special skills acquired in production hobbing of gears, are available without cost to analyze and make recommendations on gear problems. This service will help to maintain peak efficiency in your gear cutting operations. Send us inquiries about accuracy, tooling, production and special toothforms.

BARBER-COLMAN COMPANY

613 ROCK STREET • ROCKFORD, ILLINOIS

Hobs • Cutters • Reamers • Hobbing Machines • Hob Sharpening Machines

BARBER COLMAN



Cleveland worm gearing is standard on these fully-automatic machines which thread oil field pipe to rigid A.P.I. specifications, ranging from 1¼" to 13⅜" O.D. In addition to worm gearing inside the machine, note two Cleveland Worm Gear Speed Reducers in foreground.

On job 18 years, CLEVELAND drive is good as new

AFTER 18 years of continuous service in a well-known pipe mill in Pennsylvania, a Stamets pipe threading machine had its first major overhaul. When the Cleveland worm gearing was removed from the machine it looked almost like new, showed only slight traces of wear. This unretouched photograph reveals the splendid condition of both the worm and gear. In fact, the gearing is in such fine shape that it was put right back in the machine—probably good for another 18 years of strenuous pipe threading.

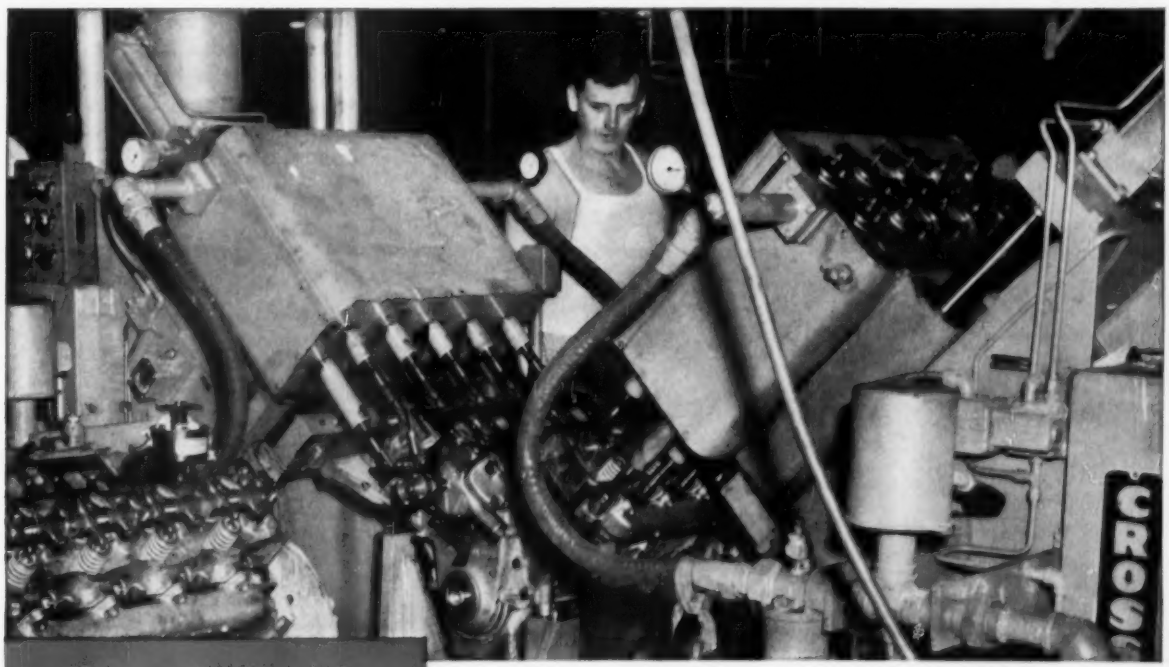
This example is one of thousands of Cleveland worm gear drives, many made 25 and even 30 years ago that are still in service today. They serve in every phase of American industry, drive every type of mechanical equipment where a powerful, trouble-free, right-angle drive is wanted.

For full presentation of the many types and sizes of Cleveland worm-gear drives available, write for Catalog 400. The Cleveland Worm & Gear Co., 3254 E. 80th St., Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication.
In Canada: Peacock Brothers Limited.

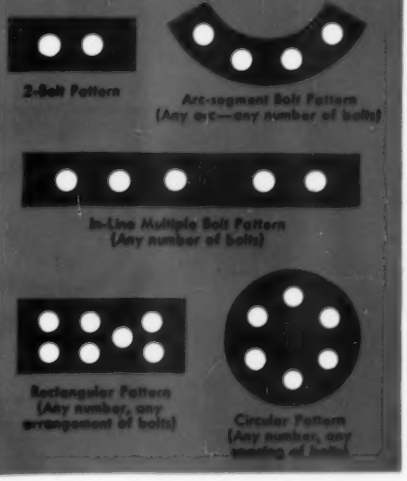
CLEVELAND
Worm Gear
Speed Reducers

Thor Automation Tools on your job can make big cuts in labor costs



Almost unlimited applications—a typical example is this Thor 22 unit multiple nutsetter used on line of leading car manufacturer's Detroit plant

Thor multiple tools can be custom-built to any pattern, any number



Thor features assure better jobs at less cost

STALL-TYPE, rigid air regulation permits driving of each nut to exact predetermined tension.

Exclusive quick-change mounting in master manifold permits 30 second change-over of individual units for inspection or replacement.

Easier to operate. Multiples eliminate torque reaction at moment nuts are seated.

Air operated plunger-type push-off rods for automatic disengagement.

Various nut heights on one job handled by axially slidable socket driving spindles.

Available in complete range of sizes for any power tool assembly operation in straight, offset or angle models.

Free design service. Thor will design and quote on a multiple nutsetter job for you without obligation on your part. For further information contact your Thor branch in the city shown below or write Thor Sales Engineering Dept., Thor Power Tool Company, Aurora, Illinois.

Thor
PORTABLE POWER TOOLS

THOR POWER TOOL COMPANY • AURORA, ILLINOIS

Atlanta • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland • Denver • Detroit
Houston • Los Angeles • Milwaukee • Newark • Long Island City, N.Y. • Philadelphia • Pittsburgh
St. Louis • San Francisco • Seattle • Toronto, Canada • Export Division, New York City

Can the Skills of Small

G-E DEFENSE SUBCONTRACTORS TYPIFY THE BENEFITS RESULTING FROM TEAMWORK BETWEEN LARGE AND SMALL COMPANIES

Over the years, General Electric defense subcontracts have been a valuable proving ground for many small businesses. Some 17,000 G-E subcontractors and suppliers have received much of the work—and the dollars—involved in G-E defense orders.

General Electric is today vigorously at work on many defense projects. But as the Armed Services iron out high volume peaks brought about by past emergencies, many G-E subcontractors have the capacity to work on other projects.

INTERDEPENDENCE OF LARGE AND SMALL BUSINESS helps growth of both when working together. William Friedman and David Krieger, part of Bogart Manufacturing's management team, review a production unit of special radar test equipment made for General Electric.

Business Firms Help You?

What these firms are doing for General Electric, many of them may be able to do for you—metal work, precision machining, rolling, forming, cutting. Some have special skills in building components, too. Take for example the Bogart Manufacturing Corporation of Brooklyn (pictures below):

Since 1949, Bogart has worked with G.E.'s Naval Ordnance Dept. at Pittsfield, Mass., on equipment for military radar testing. The company builds radar components and assemblies for fire control equipment. To get its G-E work done, it developed ingenious new techniques in assembly and manufacture. Nor did Bogart's size stand still while working with G.E. It tripled its manufacturing area, increased its employees from 50 to 150—proof of its ability to do a job, its confidence in the future.

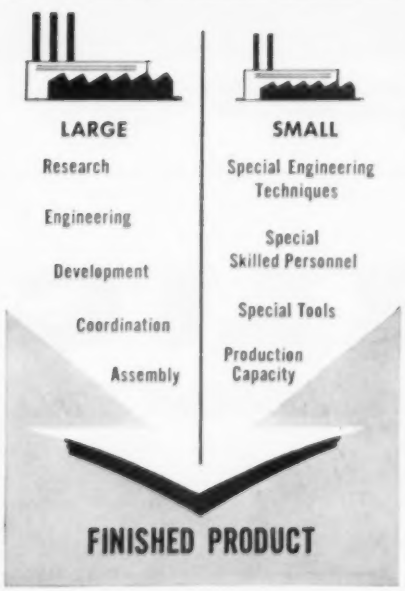
Take a look around. *Can* you use the skills of small business in your operations? For further information, see the box below.

SMALL BUSINESS provides special talents, such as design of new switch in Bogart model shop, to fill needs of larger businesses—typifying industrial partnership.

NEW TECHNIQUES, like ultrasonic soldering with aluminum, help increase Bogart's capacity for additional non-defense work. Staff has grown from 50 to 150 in six years.

OSCILLATING RADAR unit, made by Bogart, supplements big-scale radar equipment made by larger electronic firms.

HOW LARGE AND SMALL BUSINESS CONTRIBUTE TO NATIONAL PRODUCTION



Can Small Business Help You?

Thousands of small businesses, like the Bogart Manufacturing Corporation, have furnished General Electric with virtually every kind of skill and service as defense subcontractors and suppliers. Some of these companies have available production capacity, created in large part by the reduction of defense orders since the Korean War peak. This means that they may be able to apply their skills to help you.

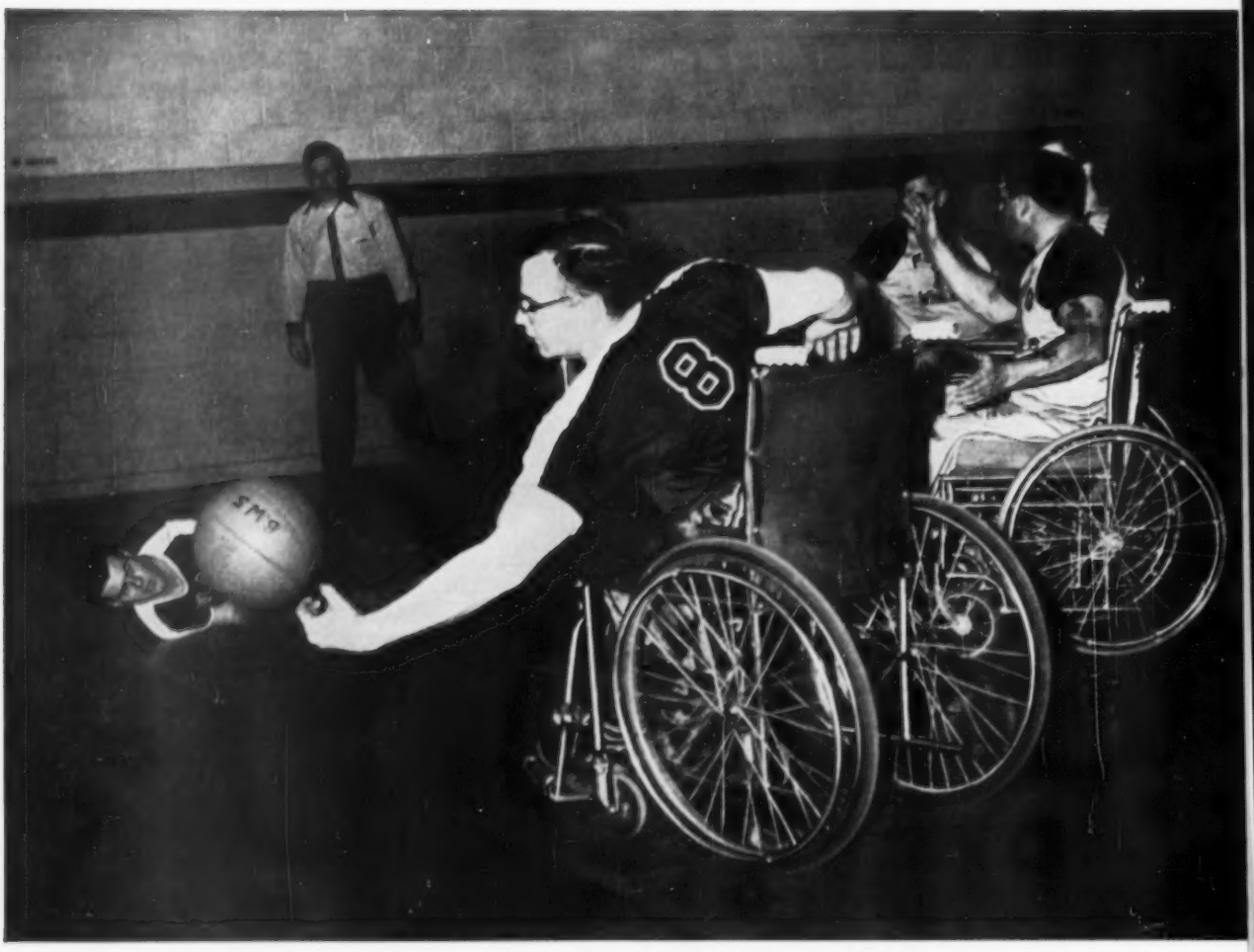
If you have a manufacturing problem or have work available for subcontracting, please write us on your letterhead, stating in as much detail as possible the type of services or skills you require. We will be glad to suggest several small businesses who have done similar work for us and may be able to help you. Write C. W. Bryant, Manufacturing Services Div., General Electric Co. 570 Lexington Ave., New York 22, N.Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

WHEN IT'S *MOVING*...MAKE IT *TUBING*

Pound for Pound, Tubular



Wheeled chairs get stiff workouts in fast-moving paraplegic basketball. Tubular construction keeps them strong, safe, maneuverable. When it's moving, make it steel tubing.

REPUBLIC

REPUBLIC STEEL

World's Widest Range of Standard Steels

Construction is STRONGEST!

At any given weight, tubing is strongest of all mechanical shapes . . . stronger under compressive load . . . stronger as a beam . . . stronger in torsion.

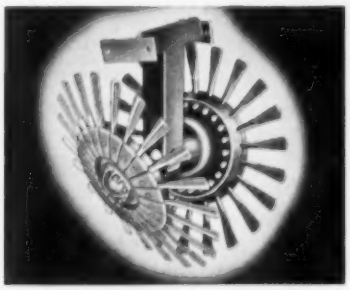
And, dollar for dollar Republic ELECTRUNITE Steel Mechanical Tubing is your best buy. ELECTRUNITE is the original electric resistance welded tube. It's the quality tube of industry, available in a wide variety of forms, sizes and gages . . . in both carbon and stainless steel.

For volume production, ELECTRUNITE tubing is consistently uniform, foot to foot, shipment to shipment. It offers uniform wall thickness and concentricity. Surfaces are free from scratches and pit marks. It offers uniform response to heat treatment. It is easy to fabricate . . . often eliminates some costly fabricating or machining operations.

When your product must be strong, safe, lightweight, investigate Republic ELECTRUNITE Steel Tubing. Republic engineers can help you design it into your products and processes, economically and profitably. Send coupon for facts.

MORE REPUBLIC PRODUCTS MADE FOR MOVEMENT:

"I PUT REPUBLIC NYLOK NUTS TO THE TEST every time I ride my Taylor Tot," reports this young test driver. In spite of all the bumps, bounces and jolts, Nylok Nuts always hold tight. The reason: a special Nylon plug that assures positive locking in any position wherever you stop wrenching. Send coupon for details.



THESE BEET DIGGER TINES ARE 24% STRONGER since John Deere switched to alloy steel. Originally fabricated from carbon steel, they would sometimes break under stress. By taking advantage of alloy's hardenability—plus superior strength—bending and abrasion problems have been eliminated. Send coupon for complete data on Republic Alloy Steels.

DOUGLAS AIRCRAFT ADDED A PASSENGER—AT NO INCREASE IN WEIGHT on their new DC-7 superliner. How? By substituting Titanium for other metals normally used in nacelle construction. Republic is an old hand at this high strength-to-weight business. Send coupon for information on how Republic Titanium and Titanium Alloys may help your product.

STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-1249
3102 East 45th Street
Cleveland 27, Ohio

Please send me more information on:
☐ ELECTRUNITE® Mechanical Tubing ☐ Alloy Steels
☐ NYLOK® Nuts ☐ Titanium
®U. S. Pat. No. 2,450,694 and pending applications.

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Company_____

Address_____

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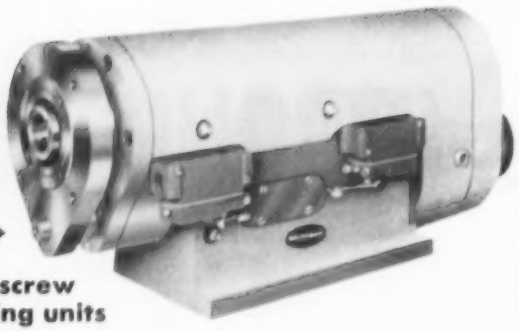
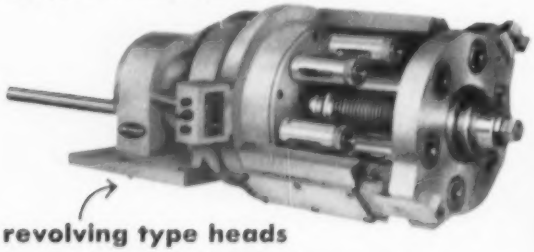


lead screw tapping units

Single-spindle or multiple-spindle, and, plain or flange quill mounting.



revolving type heads

Mount vertical on *any* center-column machine with rotating chuck.

hydraulic index tables

Simple design—maximum safety—completely hydraulically operated.

use

Michigan

Components

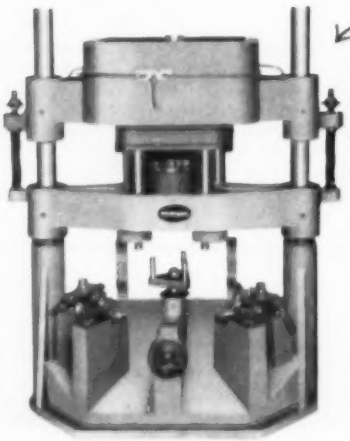
. . . For Faster, More Economical Production

Here are a few typical examples of Heads, Bushing Plates, Fixtures, Automatic Index Tables, Hydraulic Drilling and Boring Units, and, Lead Screw Tapping Units used by Machine Tool Builders and Manufacturers, who insist upon the finest, when building or re-tooling.

We also build Revolving Heads for Chucking Machines.

hydraulic drilling and boring units

All units have hardened ways, with cylinder mounted in bottom of unit.



multiple drill heads

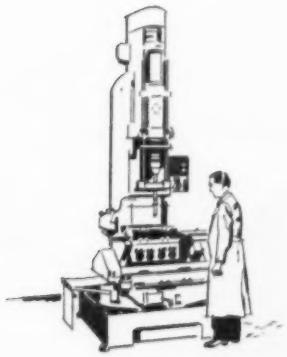
Adapted for any type drill press and feed units. Shown with bushing plate and fixture.

We solicit your inquiries on any of your Multiple Drilling Problems.

Michigan

DRILL HEAD CO. Detroit 34, Michigan

engineers and manufacturers of production machines and drilling equipment



"Today... Rejection rate is NIL!"

A large Midwest pump manufacturing company had run up against an expensive finishing problem. They were using a super finisher with an abrasive stone to cut and polish 410 stainless steel shafting to a four micro finish. The hardness of the shafting was Rockwell B60-90. Although they tried a number of honing fluids recommended by various companies, the rejection of finished shafting was high and stone life was short. On a routine call, Sinclair Industrial Representative P. W. Stevens was asked for his recommendations.

Light-bodied coolant recommended...

Mr. Stevens reports, "Examination showed the need for a light-bodied coolant specifically designed for use as a honing fluid for both ferrous and some non-ferrous metals. From previous experience with a similar problem, I recommended Sinclair HONOL Medium."

Problem solved...

Mr. Stevens continues, "The company tried Sinclair HONOL Medium on a test basis. A follow-up showed they were getting exceedingly fine finish and accuracy, with sufficient carry-off of steel particles during the honing operation. The amount of heat generated was kept to a minimum, thus preventing distortion of parts. The company reports that today their rejection rate is nil. Moreover, all pieces have the desired four micro finish, and stone life has increased considerably. This manufacturer now specifies Sinclair HONOL Medium for his finishing operations, and uses the same product for honing brass."

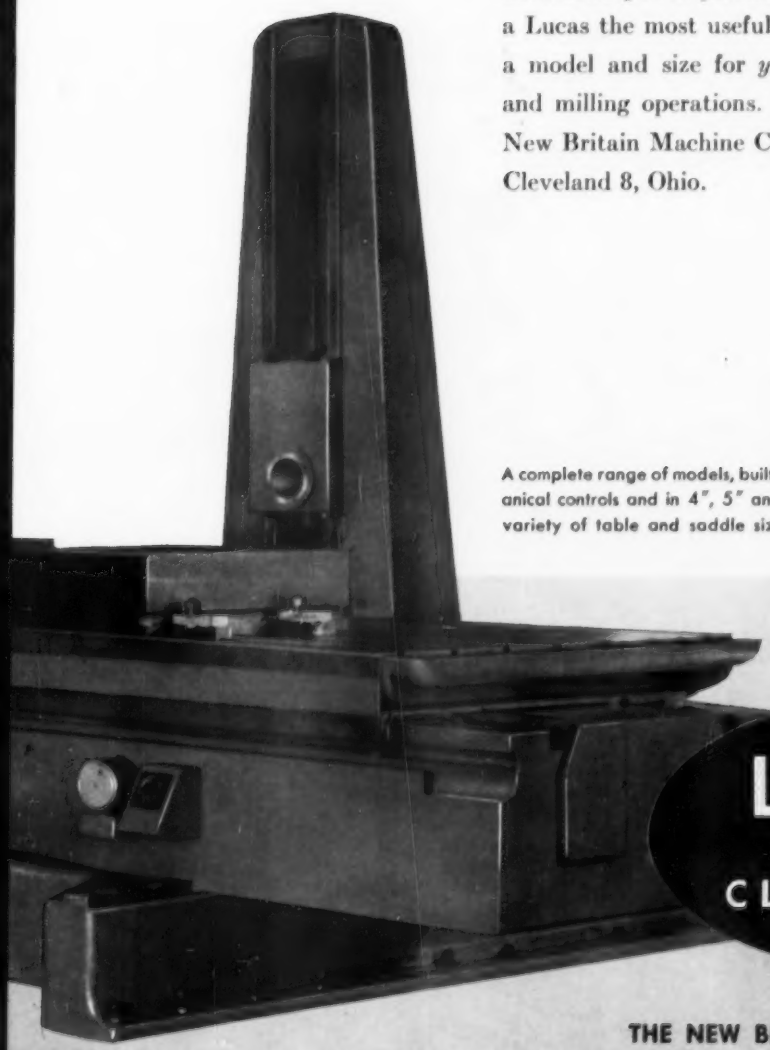
Why not let a Sinclair Lubrication Engineer help solve *your* lubrication problem. *There's no obligation.* Contact your local Sinclair office or write Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N.Y.

SINCLAIR LUBRICANTS

Model 6120 Lucas Precision Horizontal
Boring, Drilling and Milling Machine.

"the machine that can do anything"

Extreme accuracy, feather-touch pendant control, automatic power positioning for repetitive work make a Lucas the most useful machine in any shop. There's a model and size for *your* horizontal boring, drilling and milling operations. Lucas Machine Division. The New Britain Machine Company, 12302 Kirby Avenue, Cleveland 8, Ohio.



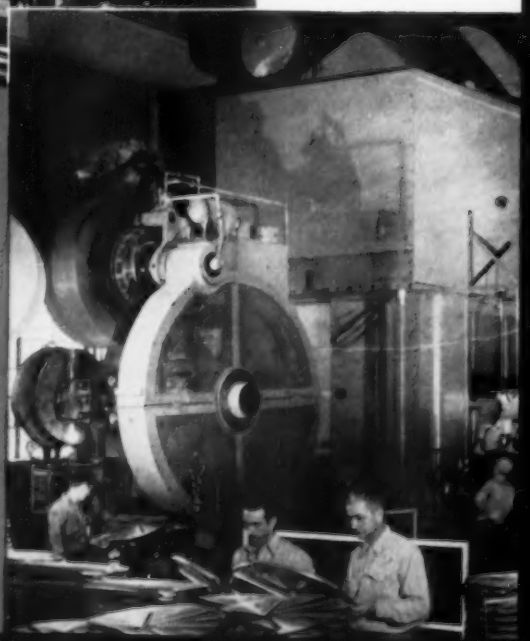
A complete range of models, built in 3", 4" and 5" spindle sizes with mechanical controls and in 4", 5" and 6" sizes with electrical controls. Wide variety of table and saddle sizes with two or four-way beds optional.

LUCAS
OF
CLEVELAND

A DIVISION OF
THE NEW BRITAIN MACHINE COMPANY

THIS ONE MAKES PANS . . . Pans are produced at the rate of ten a minute in this 700-ton seven-station Bliss transfer feed press. A 22" x 24" blank is drawn 5 1/32" deep in the first station; trimming, piercing and restriking operations follow. Pans leave the press completely finished — ready for pickling and enameling.

THESE TWO MAKE SHELVES . . . "Lazy Suzan" shelves by the millions are the product of these two 800-ton Bliss transfer feed presses and the two Bliss embossing presses stationed at their output ends. Coil stock is blanked in the first stations of the presses and work pieces carry through the remaining five stations and into the embossing press automatically. Each press produces 15 shelves per minute through two shifts.



BLISS TRANSFER FEED PRESSES STEP UP GE REFRIGERATOR PRODUCTION

Between them, they make all the pans and all the shelves GE needs for its annual output of more than half a million refrigerators!

Here's what's happening at Appliance Park: 6000-pound coils of steel feed into one end of these Bliss transfer feed presses, lines of shelves and pans march out the other ends, and only a few attendants stand by in between.

Three separate press lines are involved. One is a 700-ton, seven-station press (with coil cradle, straightener and roll feed) that produces ten deep-drawn pans a minute.

The other two – identical set-ups – are 800-ton, six-station presses, also with cradle, straightener and feed, which feed into 800-ton embossing presses (see photo). Each produces shelves at the rate of 15 per minute.

The method of operation is the same for all. Mill coils are loaded on the cradle. From there, strip feeds through the straightener and into the roll feed. At the first die station in the press a blank is cut off. The transfer feed fingers move in on the work piece and carry it to the next station. As the slide comes down, the fingers move out; as it rises, they move in and repeat the cycle. New strip is brought to the first station and a completed part delivered with every stroke of the press.

This set-up has solved a number of knotty problems for General Electric. Previously production required the services of two or three vendors, doubling and tripling the cost of dies and labor. Still further savings have come from the use of standard mill coils instead of blanks. In fact, the savings are expected to bring about an early amortization of the entire installation.

Bliss has been building transfer feed presses and systems like this since Spanish-American War days; today, over a thousand are in use. If you're faced with long-run production problems, let a Bliss engineer show you some typical uses of the transfer feed principle. Perhaps it can pull your production costs into line – as it has for so many others.

SEE IT IN ACTION . . . *A new color-and-sound movie takes viewers to the plant, shows the press in action. See close-ups of tooling, of transfer fingers, of coil feed techniques. To arrange a showing at your plant, write to E. W. Bliss Company, Canton, Ohio, or see your local Bliss representative.*

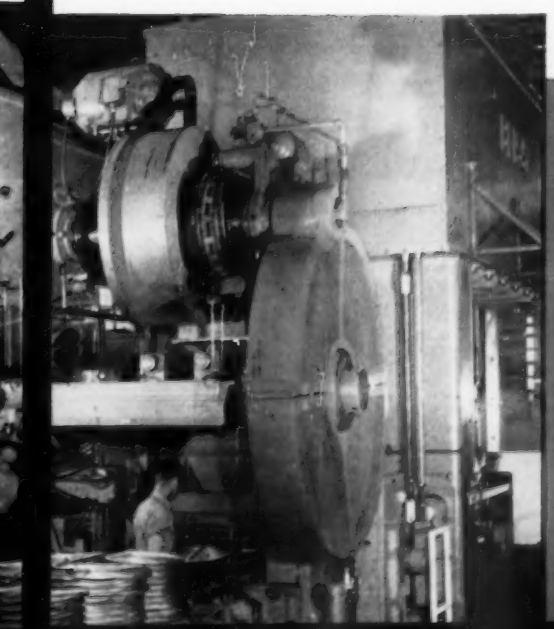
BLISS
SINCE 1857

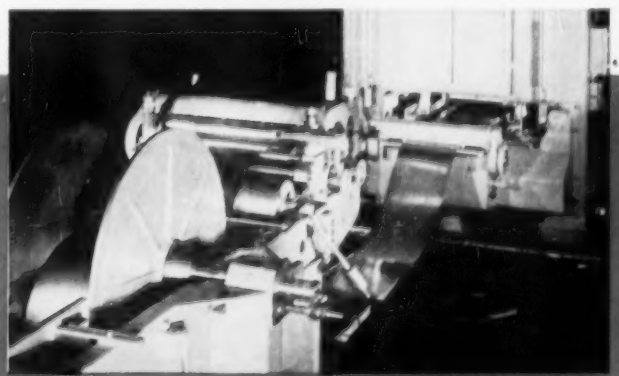
E. W. BLISS Company, Canton, Ohio

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

is more than a name... it's a guarantee

U. S. Plants in Canton, Cleveland, Salem and Toledo, Ohio; Detroit and Hastings, Michigan; Midland and Pittsburgh, Pa.; San Jose, Calif. *Branch Offices in* Burbank, Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, San Jose, Salem, Toledo, Washington, D. C.; and Toronto, Ontario, Canada; E. W. Bliss (England) Ltd., Derby; E. W. Bliss Co. (Paris), France. *Other representatives throughout the world.*





ALL THREE LINES WORK FROM COIL STOCK . . . A number of handling operations are eliminated because, on each of the three presses, strip from standard-sized mill coils are fed from this power coil cradle through a five-roll straightener and into the roll feed on the press. Blank is cut off in the first die station of the press. Though not shown here, a second coil is ordinarily held ready at the rear of the cradle to speed handling. Bliss engineers designed all the coil handling equipment and all of the tooling for each of the presses.

DESIGN AROUND THIS NEW

. . . permits motor change in minutes

Specify the
New 100 SERIES
for
MAXIMUM
HORSEPOWER
PER DOLLAR
Certified
by INDEPENDENT
LABORATORY tests

PATENTS PENDING

BOSTON Gear
100 SERIES
REDUCTORS

- **NEW** space saving design
- **NEW** clean contours
- **NEW** gearing efficiency
- **NEW** cooling fins
- **FAN COOLING** optional on larger sizes

COST-SAVING "COMBINATION"

. . . continued operation with spare

No downtime for motor repairs!

The new 100 SERIES RATIOMOTOR combines an independent gear reduction unit and an easily detachable standard end-mounted motor.

MOTOR CAN BE REMOVED AND REPLACED in a few minutes, without disturbing the gear reduction unit. Saves maintenance time, preserves alignment, permits continued operation with spare motor.

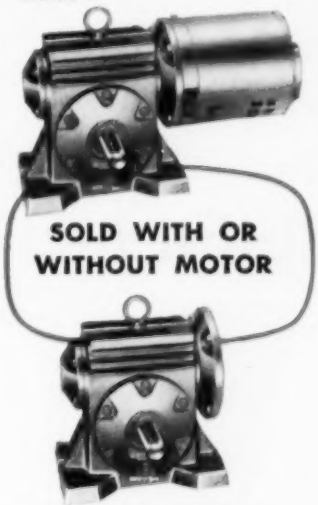
ORIGINAL MOTOR CAN BE CHANGED When conditions require change to a motor of special characteristics (totally enclosed, explosion-proof, etc.) it can easily be attached in place of the original motor.

ANY MODEL YOU NEED — FROM STOCK The new BOSTON GEAR 100 SERIES includes 1064 different units to fit any drive need. Reductors, for mechanical drives, as well as Ratiomotors and Flanged Reductors, are *standardized stock units* sold by BOSTON GEAR Distributors, located in every industrial center of the U. S. and Canada.

TALK TO A BOSTON GEAR FIELD ENGINEER Our 76-year experience as speed reducer specialists will help you simplify planning, and put your product ahead in design. Your Boston Gear Distributor will arrange a call, or write: Boston Gear Works, 64 Hayward St., Quincy 71, Mass.

RATIOMOTORS

The complete power package. Gear unit has fin-cooling and other high efficiency features of new 100 Series Reductors.



FLANGED REDUCTORS

The Ratiomotor gear unit, supplied without motor. You buy and attach any standard end-mounted motor of your own choice.

Call your **BOSTON** *Gear*®
DISTRIBUTOR

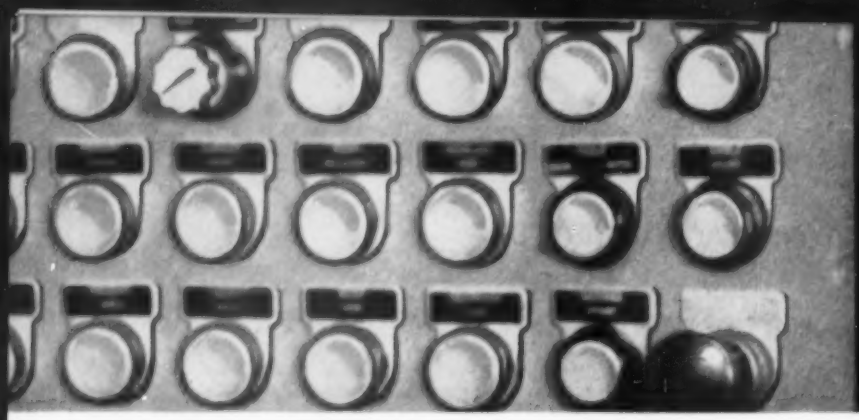
For nearest Distributor, look under "GEARS" in the Yellow Section of your Telephone Directory.

108 MODELS — 1064 DIFFERENT UNITS — FROM STOCK

GET NEW CATALOG R-56

Lists models for any drive . . . horizontal or vertical — right angle or parallel — single or double reduction. Includes handy selection charts, engineering data.

55-BG-R-17



PUSH-BUTTON ECONOMY

Yesterday, Jones & Lamson broke through the speed barrier with high-velocity metal turning.

Today, advanced engineering at Jones & Lamson again pioneers in attacking a critical cost consideration: the *man-hour* factor.

Here are a few of the engineering innovations which are strategically important for (1) minimizing operator fatigue and human error (2) speedy change-over and retooling, and (3) push-button simplicity of operation:

In Turret Lathes: Geneva saddles and Hydra-Clutch headstocks; automatic thread chasing; one- or two-way tracing combined with normal Turret Lathe operation; Numerical Tape Control for Automatic Turret Lathe.

In Automatic Lathes: Automatic handling; feed-back; gaging; sorting; chip disposal.

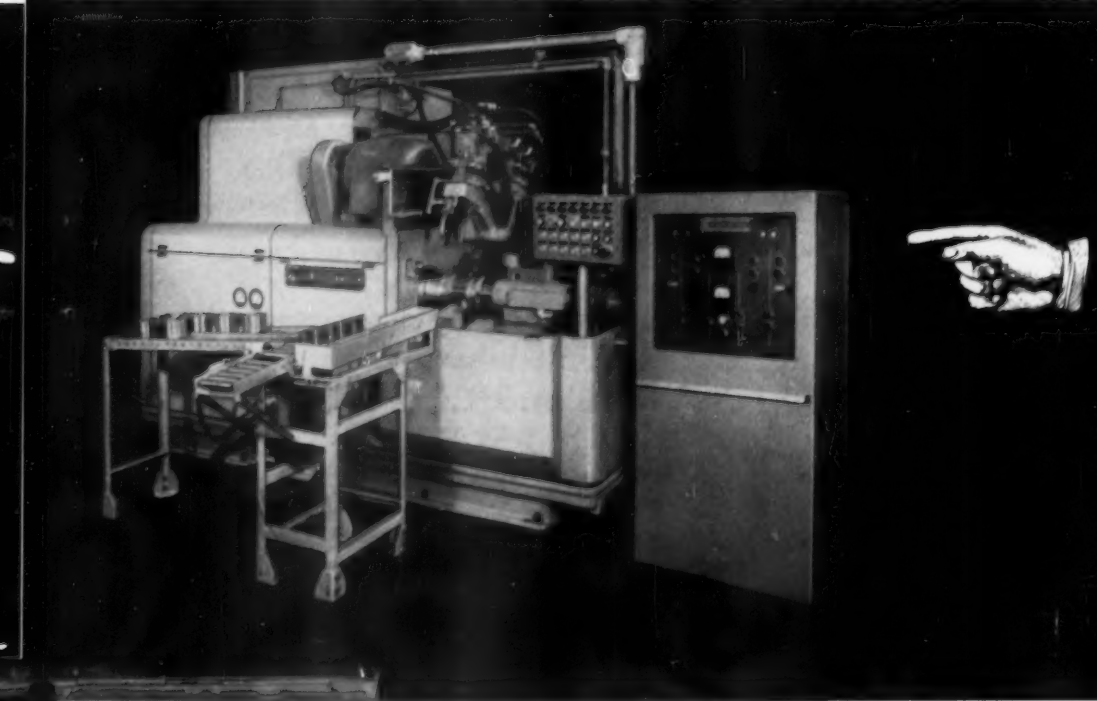
In Grinders: Automatic Tap Grinders; Optical Contour Grinders; automatic handling for Thread and Form Grinders.

These are typical results of our all-out efforts toward machine design that will reduce costs, increase production, and keep both operators and management happy.

The man who needs a new machine tool is already paying for it.

JONES & LAMSON MACHINE CO • 502 CLINTON ST • SPRINGFIELD, VT.

Turret Lathes *Fay Automatic Lathes* *Milling & Centering Machines* *Thread & Form Grinders* *Optical Comparators* *Threading Dies & Chasers*



A.S.T.E. INDUSTRIAL EXPOSITION and CONVENTION

INTERNATIONAL AMPHITHEATER, CHICAGO, MARCH 19-23

Investigate

NEW ABRASIVE APPLICATIONS

Never Before Associated with Finishing....

RUBBER-CUSHIONED "JOB-MATCHED" STOCK ABRASIVES

That Do The Work Of "Specials"

NOW YOU CAN COMBINE OPERATIONS, REPLACE SLOWER, COSTLIER METHODS. Use the same *stock* "job-matched" Brightboy textures you select for special jobs to do many other kinds, too.

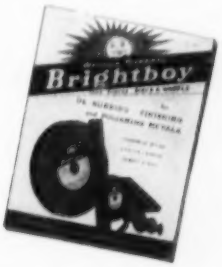
UNBELIEVABLE? Perhaps. But it's true! Not until you have tried Brightboy and witnessed its unique rubber-and-abrasive action can you appreciate the completely new, wider concept which it has pioneered in finishing.

Brightboy BURRS, CLEANS, FINISHES, POLISHES—frequently in one operation. It is available in both Silicon Carbide and Aluminum Oxide grains, each in combinatons of grain sizes and textures from extra fine to extra coarse, in soft, firm and tough rubber binders. Its versatility and adaptability will amaze you.

DIAMETERS TO 8"

Ask your dealer to recommend the readily available Brightboy stock abrasives best suited to your work, and also for the new Brightboy catalog. Write us if he cannot supply you, or with regard to any problem in which finishing is involved.

Brightboy is made in wheels as well as in a full range of accessory products—rods, sticks and blocks—for machine and manual operations.



BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
95 North 13th Street, Newark 7, N. J.

America's Pioneer Manufacturer of Rubber-Bonded Abrasives

WELDON ROBERTS
Brightboy
REG. U.S. PAT. OFF.
RUBBER CUSHIONED ABRASIVES

Expensive parts machined to close tolerances are always in danger of being scratched by jagged chips hiding in the weave of ordinary wiping material. Parts so damaged have to be reworked . . . sometimes scrapped entirely.

This wiping job could cost $50

They're easy to distribute . . .

They really soak up oil . . .

Always a clean one handy . . .

Just toss 'em in the trash . . .

When you use Scott Wipers, chips don't come back to scar men and metal . . . there's always a clean new wiper handy. You use one thoroughly and throw it away. No more expensive collection, sorting, laundering and distribution.

. . . this one cost less than ½¢

The Difference is . . . Scott Wipers

Strong, highly absorbent Scott Wipers can be used and reused. Yet they cost so little you can throw them away after a single use when the job calls for a clean wiper, free of chips and abrasive material.

Scott Wipers are reducing the cost of wiping in many companies. Sorting and baling are eliminated. Handling and distribution are simplified. Laundering becomes a thing of the past.

This is sanitary wiping. A man uses a Scott Wiper thoroughly, throws it away—takes a new one. No danger of cuts from hidden chips . . . no fear of skin infection from dirty wipers.

Put the Scott Wiper through its paces on your production line. Your local Scott representative or distributor is ready to demonstrate any time you say. Call today or mail this coupon.

SCOTT PAPER COMPANY
Dept. W-1, Chester, Pa.
Please send me more information about Scott Wipers.

Name_____

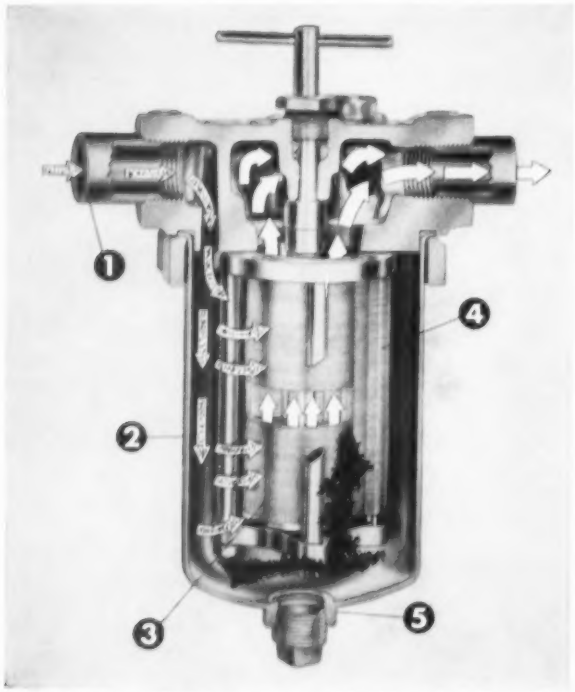
Company_____

Position_____

Address_____

NOW! 40-micron, self-cleaning filter

It's the new Cuno SUPER Auto-Klean



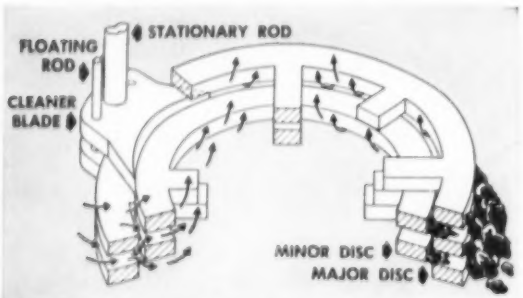
HOW IT WORKS. Dirty oil enters inlet (1) at left, fills housing (2) and flows through metal edge-type filter (3). Clean oil rises through center of filter, leaves at right. Dirt combed out by cleaner blades (4) is removed through drain (5).

Cuno's new SUPER Auto-Klean is the first practical, compact micronic filter for lubricating oil, hydraulic fluid, coolant, fuel, and other industrial fluids.

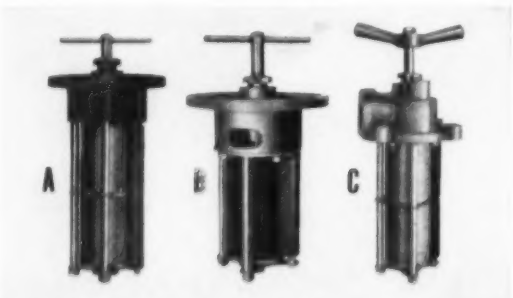
Many times smaller than other micronic filters of equal capacity, Cuno's new SUPER Auto-Klean filter now makes possible economical, micronic filtration at high flow rates and eliminates the need for replacement cartridges in most cases. Here's what it offers:

1. **Full-flow** 40-micron filtration with a self-cleaning filter. Positive protection against particles larger than 40 microns (actually 0.0015 in.). All-metal filter can't rupture or channel.
2. **Easy cleaning.** Just turn the handle—by hand or continuously with motor drive. No interruptions for cleaning.
3. **No cartridge changes.** Ends operating costs if you've been using cartridge filters.
4. **Low pressure drop, no pressure drop build-up.** An 8" by 2¾" SUPER Auto-Klean filters 30 gpm of 200 SSU oil with only 3 psi pressure drop—up to 75% more with slightly higher pressure.
5. **High capacity in a small package.** Many times smaller than replaceable-cartridge type filters of equal capacity, it saves with lower initial costs, lower installation costs.
6. **Easy to build into new equipment.** Available for line-type housings *(left)* or incorporation in sump or reservoir *(below.)* Works in any position.
7. **Easy to install in old equipment.** Fits existing Auto-Klean housings. You can easily replace most 2¾" diameter elements with SUPER Auto-Klean for finer filtration.

Write today for complete technical data on the new SUPER Auto-Klean for your new or existing equipment. Ask for Catalog No. SAK-057. Cuno Engineering Corporation, 1-3 South Vine Street, Meriden, Connecticut. 59



FILTER ELEMENT consists of stacked major and minor discs and cleaner blade bearing against minor discs. Small arrows show flow. Short restrictions between minor and major discs stop 40-micron particles but allow high flow rate.



FILTERS FOR INTERNAL PIPING *(A and B above)* allow streamlined design plus the best infiltration. Flange mounting with external outlet *(C above)* and line-type *(large cutaway above left)* are just a few of many other possibilities.

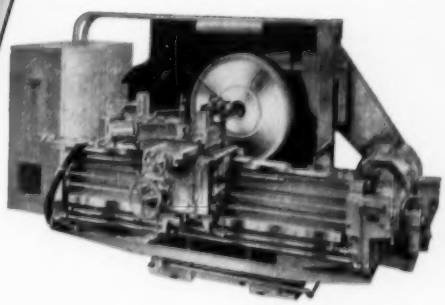
CUNO **ENGINEERED FILTRATION**

Removes More Sizes of Solids From More Kinds of Fluids

AUTO-KLEAN (edge-type) • MICRO-KLEAN (fibre cartridge) • FLO-KLEAN (wire-wound) • PORO-KLEAN (porous metal)

There's only one T lathe

. . . designed and perfected by Lodge & Shipley for ANY large diameter, short length work



As the use of Lodge & Shipley T Lathes spreads over an ever-widening variety of applications, the extreme versatility of this lathe becomes more apparent. Wherever large diameter, short length workpieces must be faced, turned or bored, the T Lathe proves notable accuracy and productivity.

Evaluate your own work of this nature, work that may now be machined on oversize lathes, boring mills or other makeshift set-ups. Transfer to a T Lathe for faster, lower cost production and release the other machines to more suitable uses.

T Lathes are far faster, more sensitive and much more accessible. They take less floor space and cost less than comparable machines. Get the facts . . . write for Bulletin 215. **The Lodge & Shipley Co., 3055 Colerain Ave., Cincinnati 25, Ohio.**

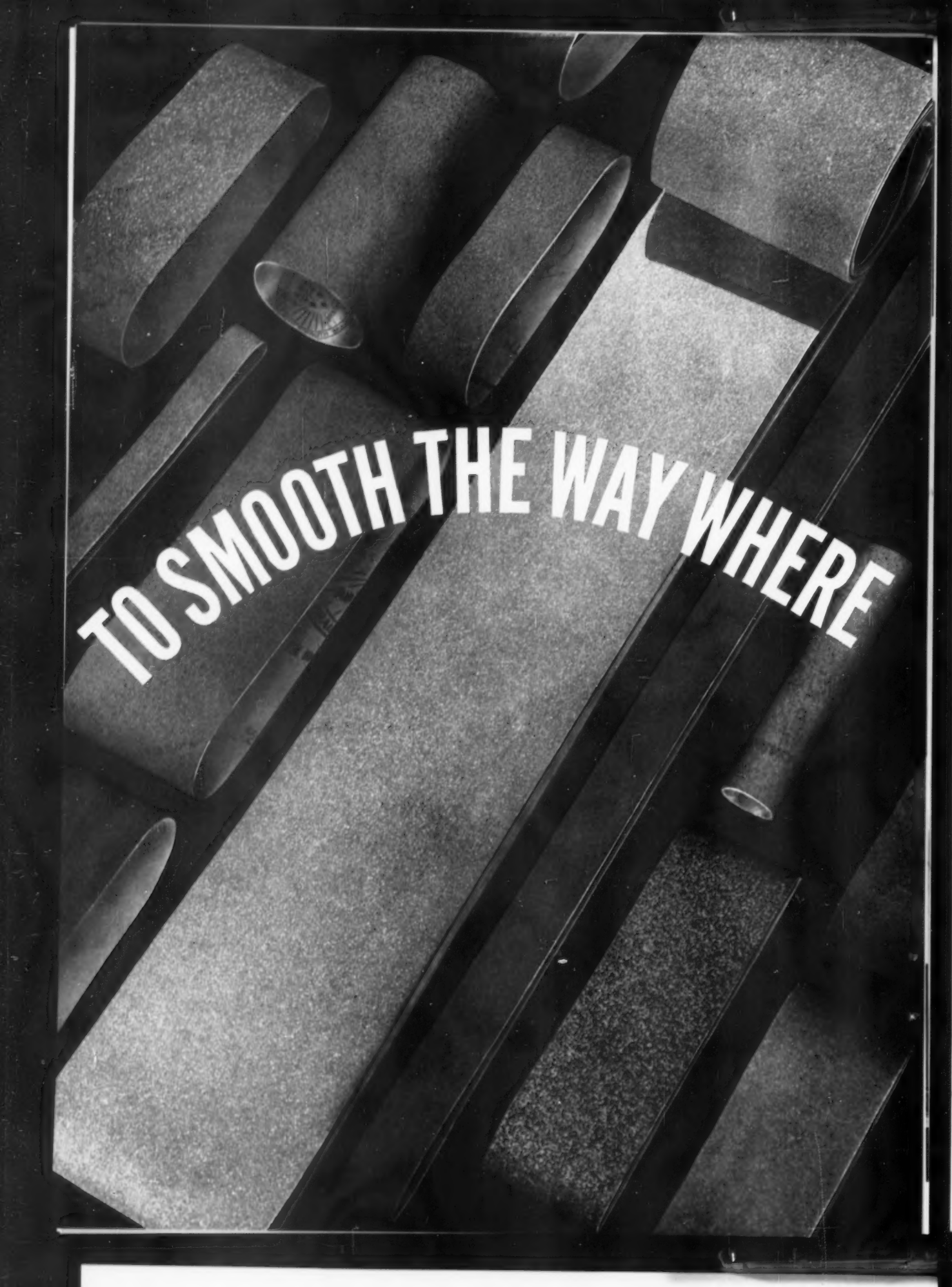
There are 8 types of T Lathes to fit every production requirement in various combinations of:

. . . straight and angular facing, turning and boring, and

. . . contour facing on both sides of center, contour turning and boring.

Lodge & Shipley

. . . . your LODGE-*ical choice!*


TO SMOOTH THE WAY WHERE

THE BELT WITH A VELVET JOINT

All JEWEL BRAND Abrasive Belts are finished by the velvet joint process — a development of the AP Laboratory and a major contribution to the advance of the abrasive industry. Velvet joint belts lie smooth . . . do not jump or bump under the work.

A COMPLETE LINE OF ABRASIVES

Abrasive Products, Inc., manufactures a complete line of JEWEL BRAND coated abrasive products in various combinations of grain, bond, backing and flexibility.

A SPECIAL TYPE OF QUALITY CONTROL

More than modern methods and rigid standards control each step in the manufacture of JEWEL BRAND Coated Abrasives . . . there's an inherent pride of workmanship developed by long-service employees in a country-located plant that helps to assure superior quality.

THE GOING IS ROUGH...

CALL ABRASIVE PRODUCTS, INC.

South Braintree 85
Massachusetts

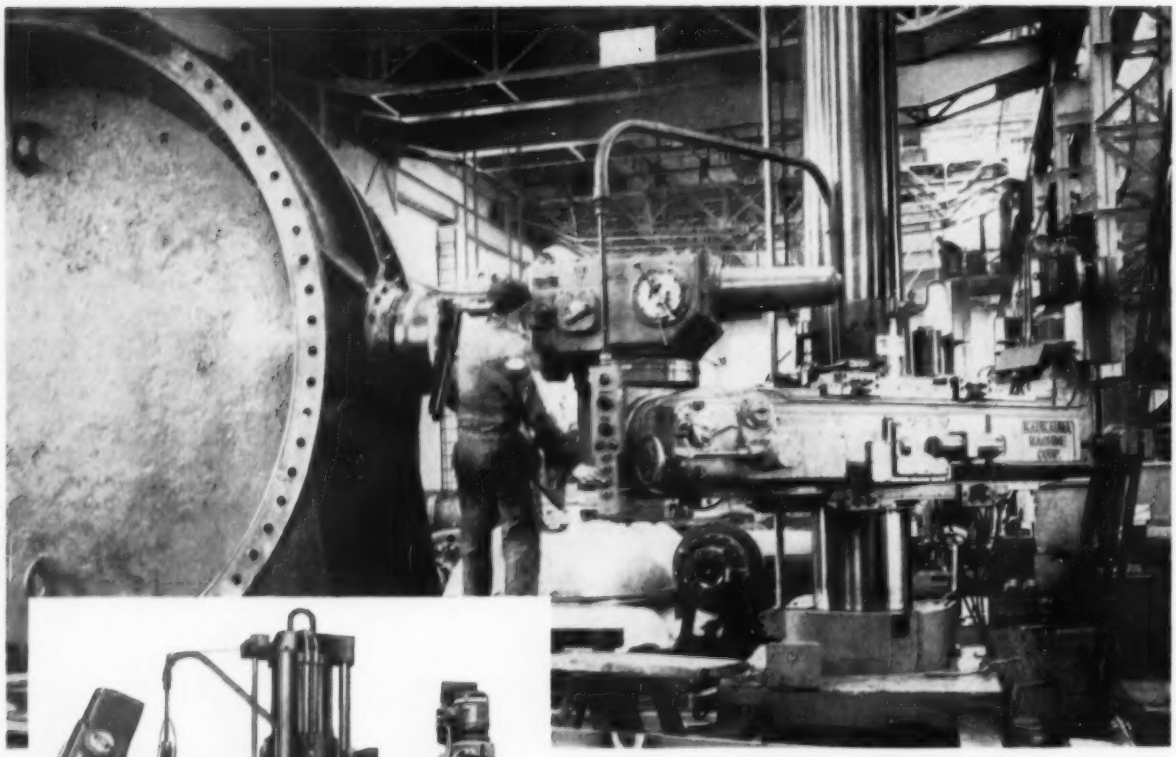
SALESMEN WITH AN EYE ON SERVICE

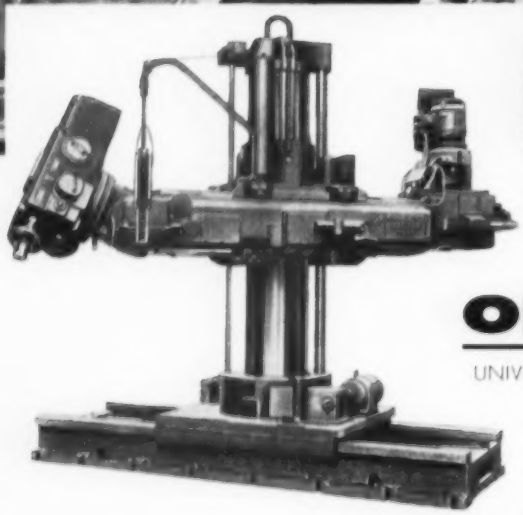
AP salesmen capitalize on the flexibility of their plant facilities to provide an extra measure of service with every order, and they make a special effort to anticipate as well as know their customers' requirements.

JEWEL BRAND

COATED ABRASIVES

JEWELOX • JEWELITE • JEWEL GARNET • NEW PROCESS • JEWEL EMERY • PILGRIM FLINT





A JOB THAT ONLY A *Kaukauna* CAN DO –

UNIVERSAL RADIAL DRILLING, TAPPING AND BORING MACHINE

faster, easier, at lower production cost.

In the large steam turbine division of one of the world's great manufacturing corporations, one setup of the Kaukauna Model 140-U Universal Radial Drilling Machine is generally all that is required for all the holes in heavy, cumbersome housings.

Drilling usually starts with the vertical holes on the top of the housing. The headstock is then swung to an angular position to drill and tap the required 3½-inch and 4-inch pipe taps. Continuing the swing to horizontal position, holes are drilled and reamed for mounting flanges, pipe flanges and accessories.

During all these operations, neither the Kaukauna nor the housing is moved.

Time and labor savings are tremendous. Before the Kaukauna Radial was employed, these huge castings were carried to the radial drills and horizontal spindle machines where they were set up at precarious angles on blocks and jacks for certain holes; then moved to other machines for other drilling operations.

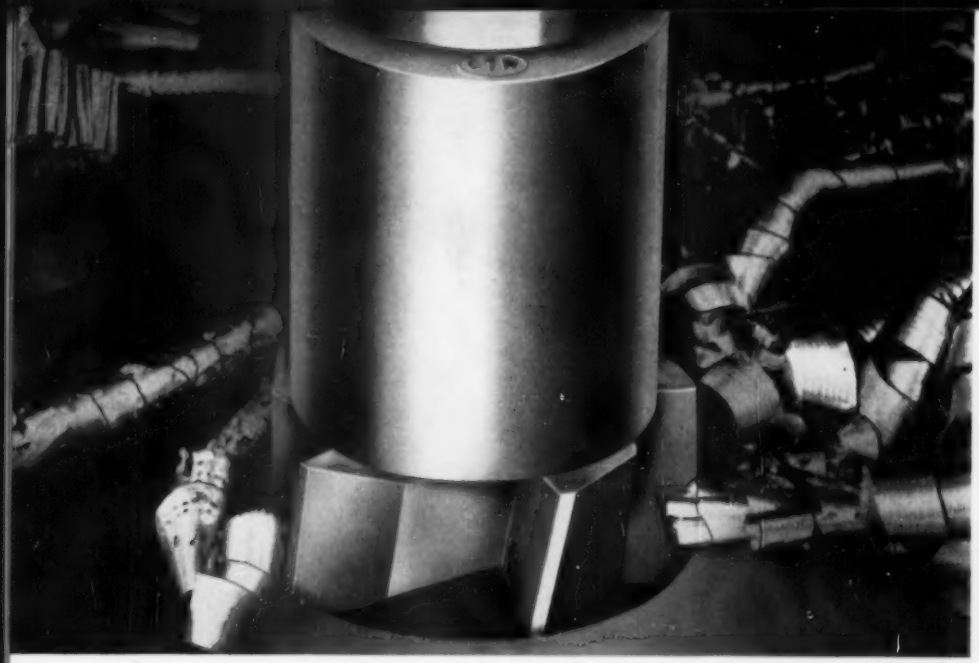
—and there is also an important *plus* saving! Many times during assembly, it may be necessary to do reworking—redrilling stud holes or adding additional holes to an assembled part. When these situations arise, the Kaukauna can be carried by overhead crane right to the assembly area and the necessary operations performed without disassembling or dismantling the unit.

Learn now what a Kaukauna will do for you by time-estimates on your various jobs.

Consult your nearest Kaukauna distributor, or phone, wire or write direct.

KMF *Kaukauna* MACHINE AND FOUNDRY DIVISION

GIDDINGS & LEWIS MACHINE TOOL CO. • KAUKAUNA, WISCONSIN, U. S. A.



Counterboring a hole in a steel workpiece. Notice the chip uniformity. Here is evidence of the free-cutting action you get with Continental Counterbores. Double driving lugs on the cutters engage double abutments in the holders to give a balanced, positive drive. Notice, too, the wide cutter flutes aiding in chip disposal.

CTW

How to get smooth cutting and ruggedness with large diameter COUNTERBORES

And even after the toughest cuts the Continental Cutter disengages from the holder with a quick *twist of the wrist.* Because of the shape of the driving members, wedging or jamming cannot occur to delay the interchanging of cutters.

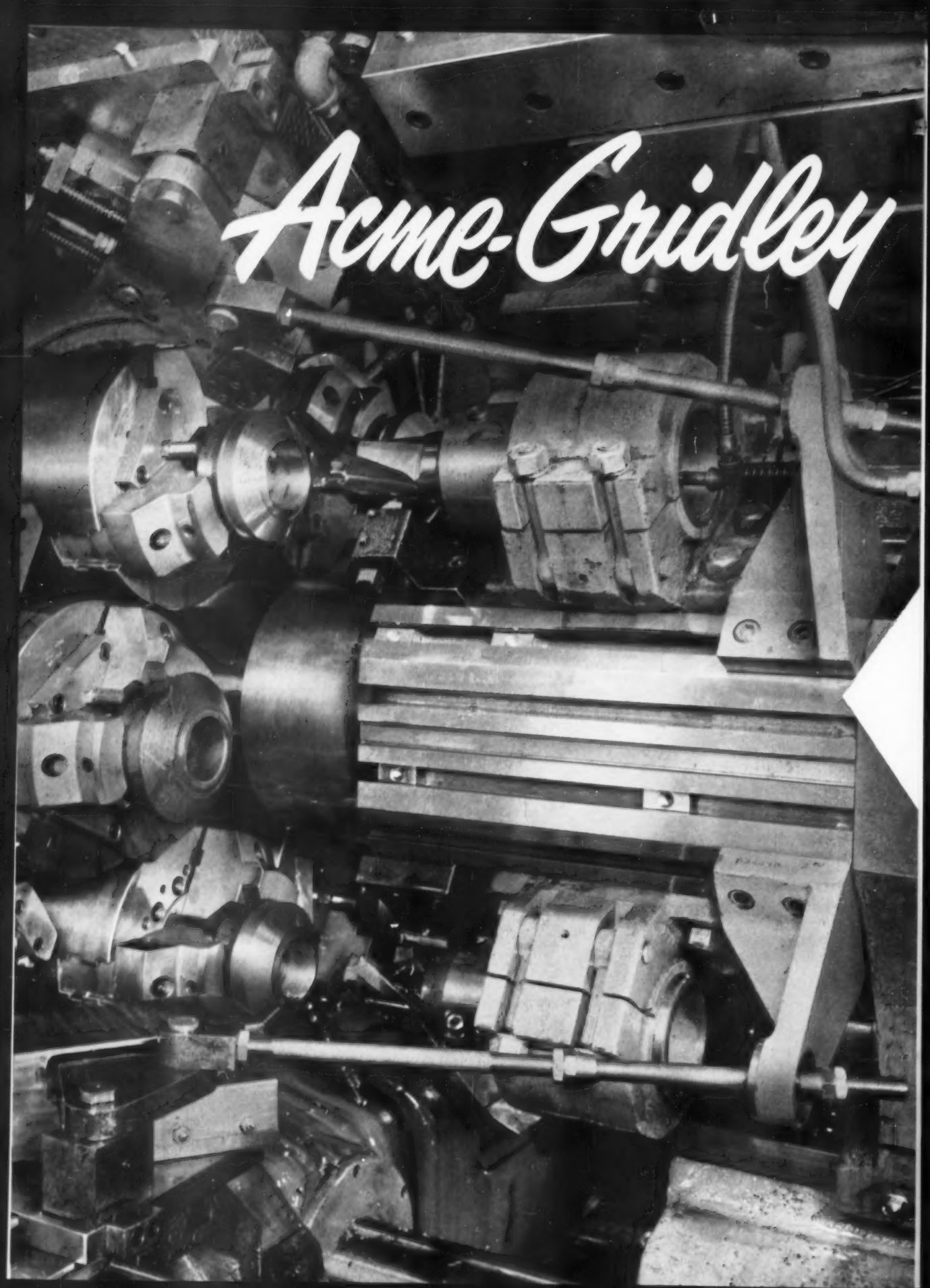
and quick, twist-of-the-wrist disengagement, too

Machine operators know that the real test of a counterbore drive is how it stands up under the stresses imposed during large diameter cutting operations. And operations like these have been the proving ground for Continental Counterbores. In customers' plants Continental Drives and Cutters, regardless of size have demonstrated their extreme ruggedness. An added feature to save minutes: Each Continental Counterbore Holder accommodates a wide range of cutter sizes.

Continental Counterbore Sets are available in your choice of sizes. Each is fully described in Bulletin 60446. Write for your copy today.

Continental TOOL WORKS
Division of Ex-Cell-O Corporation
Detroit 32, Michigan

55-37


Acme-Gridley

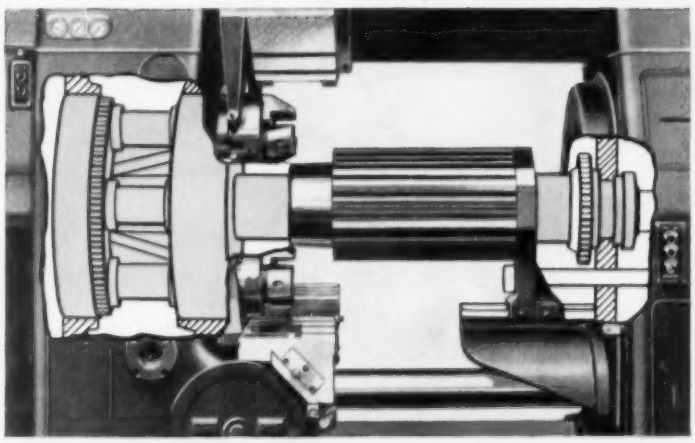
sound basic design

means greater production at lower cost

Accurate alignment of the tools and the work, every time the carrier indexes—and the rigid maintenance of this very precise alignment throughout every machining operation—provides greater precision all day long, less inspection, fewer rejects.

This accuracy resulting from sound basic design is one of the many reasons why Acme-Gridleys are setting new records for consistently accurate production every day.

- Spindle carrier integral with stem.
- End toolslide provided with bushings closely fitted to carrier stem and protected by front and rear seals.
- Toolslide further supported by rugged guide arm to heavy guide plate below carrier stem.
- Two wide spindle carrier bearings in headstock frame and a heavy-duty bearing in gear box provide maximum support.



LET US TELL YOU MORE ABOUT *Acme-Gridley* BASIC DESIGN

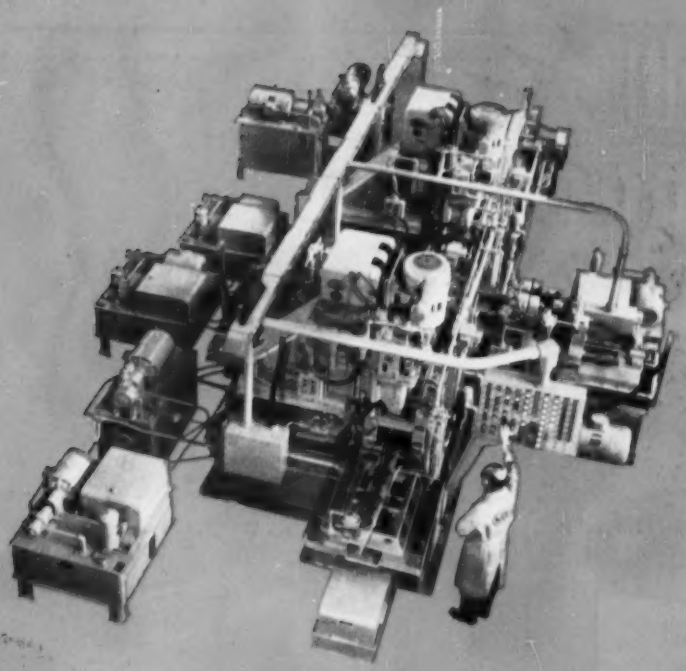
This is but one of many BASIC DESIGN features which are responsible for Acme-Gridley's outstanding performance records. May we send you additional information? Or, better yet, let us send a representative to discuss possible production short cuts with you.

National Acme

THE NATIONAL ACME COMPANY, 171 EAST 131ST STREET, CLEVELAND 8, OHIO

SALES OFFICES: • Newark, N. J. • Chicago, Ill. • Detroit, Mich.

Here's Automatic Production On High-precision Parts



When is fast transfer production limited by precision requirements? This frontier is steadily being pushed back by Natco engineers in new Holeway processing machines.

Take this throttle body, for example. The large holes are reamed to *limits of .0015" for location, .0003" for size, 125 microinch* finish! Production—*600 parts per hour!*

Natco's high-speed gun-drilling heads give required finish in interrupted throttle-shaft holes without reaming. Size is held to within .001".

Many unusual problems are solved in locating, holding and positively controlling light-weight parts between stations at high transfer speed. Chip disposal is automatic; cutting oil is filtered for re-use.

Here's the sequence of operations. Combination rough and semi-finish ream four large holes. Gun drill two holes (two breakthroughs each). Finish ream four large holes.

***Whenever* fast, automatic production makes sense, don't let high-precision requirements stop you. A Natco engineer can tell you in a hurry whether it's feasible and how the job can be done.**

National Automatic Tool Company, Inc.

Richmond, Indiana

Multiple-spindle drilling, boring, facing and tapping machines
Special machines for automatic production

NATCO

Notes from Natco...

Beating the Index Hex

Common design dilemma . . . heavy rotating tables and high-speed indexing just don't want to mix. Priding ourselves on being good mixers, we added a hydraulic decelerating device, giving us tables that index faster than ever and still stop on a gnat's eyelash.

Automatic Squirt

Universal joints universally demand frequent lubrication. Our adjustable joint-drive heads now include automatic lubrication. Once the timer's set, the oil will jet . . . at any time interval you select. One more thing the operator can forget about.

One Will Get You Four

Here's an investment return that makes Florida real estate look like shaky speculation. Sixteen months ago one of our customers bought a new Natco light sensitive multi-driller and tapper. Cost . . . under $5,000. To date they report direct labor savings of $20,000.

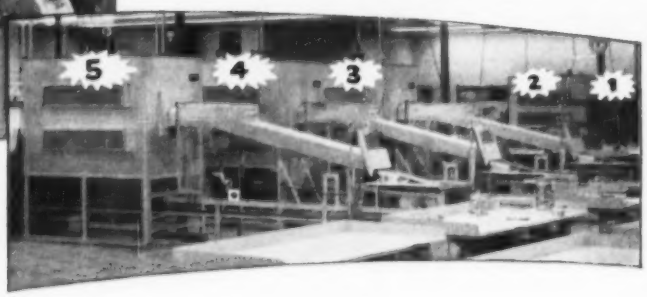
Processed by Natco Machines

Part: Front Axle Support
Machine: Natco 3-way horizontal
Operations: Drill 7 holes; Core drill 1 hole; Combination drill and chamfer 4 holes; Combination drill and spotface 1 hole; Tap 11 holes
Production: 16 per hour

Part: Crankshaft
Machine: Natco trunnion type
Operations: Drill, face and tap 1 hole; Drill, chamfer and ream 6 holes; Drill, semi-finish and finish ream 1 hole; Drill and ream 1 hole; Tap 6 holes
Production: 42 per hour

Part: Steering knuckle
Machine: Natco trunnion type
Operations: Spotdrill 4 holes; Drill 5 holes; Spotface 5 holes; Ream 2 holes; Combination ream and counterbore 1 hole
Production: 250 per hour

7 S&W Furnaces at SPERRY RAND



In the Sperry Electronic Tube Division of SPERRY RAND, Gainesville, Florida, a battery of 7 Sargeant & Wilbur furnaces perform faithfully and economically, aiding in the production of klystron tubes.

● Five S&W Conveyor Furnaces with 15" belts are used for silver and copper brazing of klystron tube components, as well as for degassifying and oxidizing.

Two S&W Pusher Furnaces are used primarily for brazing operations.

Atmosphere is dissociated ammonia, produced from two 2,000 CFH S&W Ammonia Dissociators.

Purging atmosphere is supplied by a 1500 CFH Forming Gas Generator. This atmosphere is dried by an automatic, activated alumina dryer.

Write today for literature—and state your problem. Our staff of engineers is ready to advise without obligation.

Representatives

WM. D. PRICE
611 Ann Street — Box 414
Monroe, North Carolina

JOHN FIGNER CO.
1123 LaClaire Ave.
Pittsburgh 18, Pa.

ROY M. JAHNEL
1095 Conn. Ave., N.W.
Washington, D. C.

M. CLAYTON SCHWER
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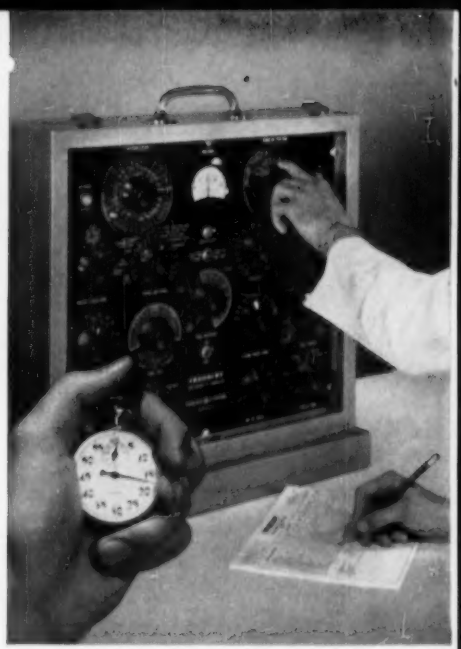
Toronto 16, Ontario

SARGEANT & WILBUR, INC.
185 Weeden St., Pawtucket, R. I.

Complete Line of Electric and Fuel Fired Heat Treating Equipment • Furnaces • Generators • Ammonia Dissociators Gas Conditioning Equipment • Accessories



Set dials for the values of each of the known variables. (Time: 1-2 minutes.)

Turn dial of unknown variable until meter balances at zero setting. (Time: 10-15 secs.)

Read the answer directly off the dial. No computations are necessary. (Time: 10 secs.)

SOLVE MACHINING PROBLEMS IN SECONDS WITH CARBOLOY MACHINABILITY COMPUTER

- **Calculate production, tool life, horsepower, or any of 16 other basic machining variables**
- **Eliminate wasteful tryout runs, improve existing setups**

The Carboloy® Machinability Computer is a new engineering tool designed to solve complex machine setup problems in seconds, instead of hours.

It calculates the effect of the 19 most critical machining variables on the material to be cut, the cutting tool, and the cutting conditions . . . shows how to set up optimum operating conditions for any metal-cutting job, and how to improve existing setups by the right variation of operating conditions.

For production men, methods men, etc.

The Computer assists production men by determining rate of metal removal, and by immediately showing how production is affected by changes in feed, speed, depth of cut, tool material, and other key variables.

It will eliminate wasteful, nonproductive trial runs, saving valuable stock and setup time. It also determines machine output for methods men, pieces per hour for estimators, and it answers other problems pertaining to machining . . . providing accurate solutions in seconds for problems that normally take hours.

Easy to use

The Carboloy Machinability Computer is easy to operate. Anyone with machining experience can use it after a short familiarization period.

The computer is portable (weighs only 32 lbs.), battery-operated, and measures 21" x 7" x 20". Price: $495, f.o.b. factory, Detroit.

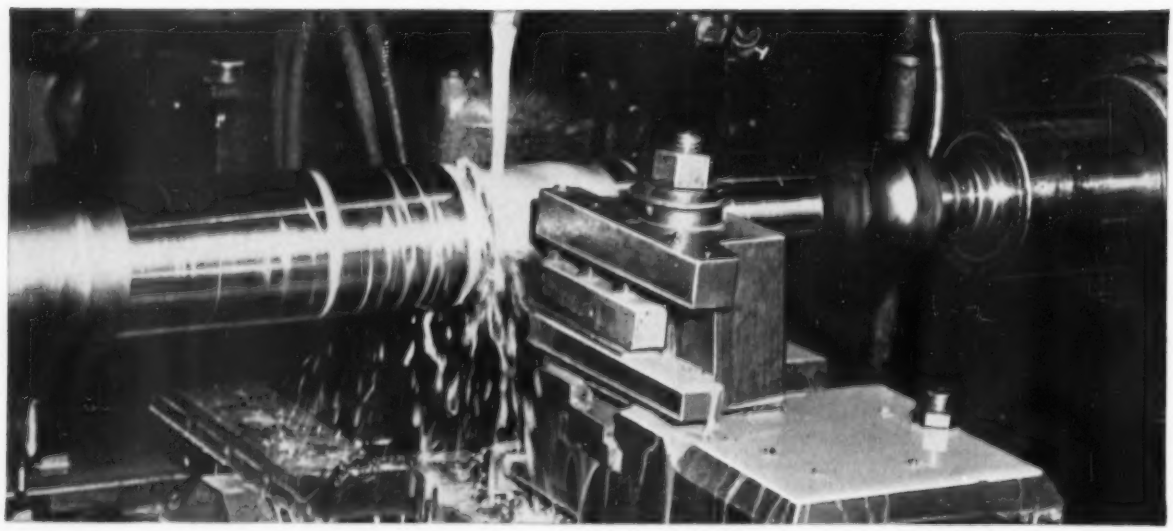
Whether your plant is large or small, the Carboloy Machinability Computer can pay for itself by increasing production, reducing manpower costs. Send the coupon on page 4 of this advertisement for full details. We will arrange a demonstration in your plant.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

TURNING AND FACING TURBINE WHEEL HUBS. Before Grade 370, a 12-inch Fay Automatic (pictured on opposite page) required more than five minutes to drill, turn, and face the rough Inconel X forging (shown at top, left) . . . and the machine was shut down half the time because tools required constant regrinding. Here are the results after Kelsey-Hayes Wheel Company switched to Carboloy Grade 370: machining time per piece cut 40%; production and tool life almost doubled; downtime drastically reduced; finish improved (shown at bottom, right).

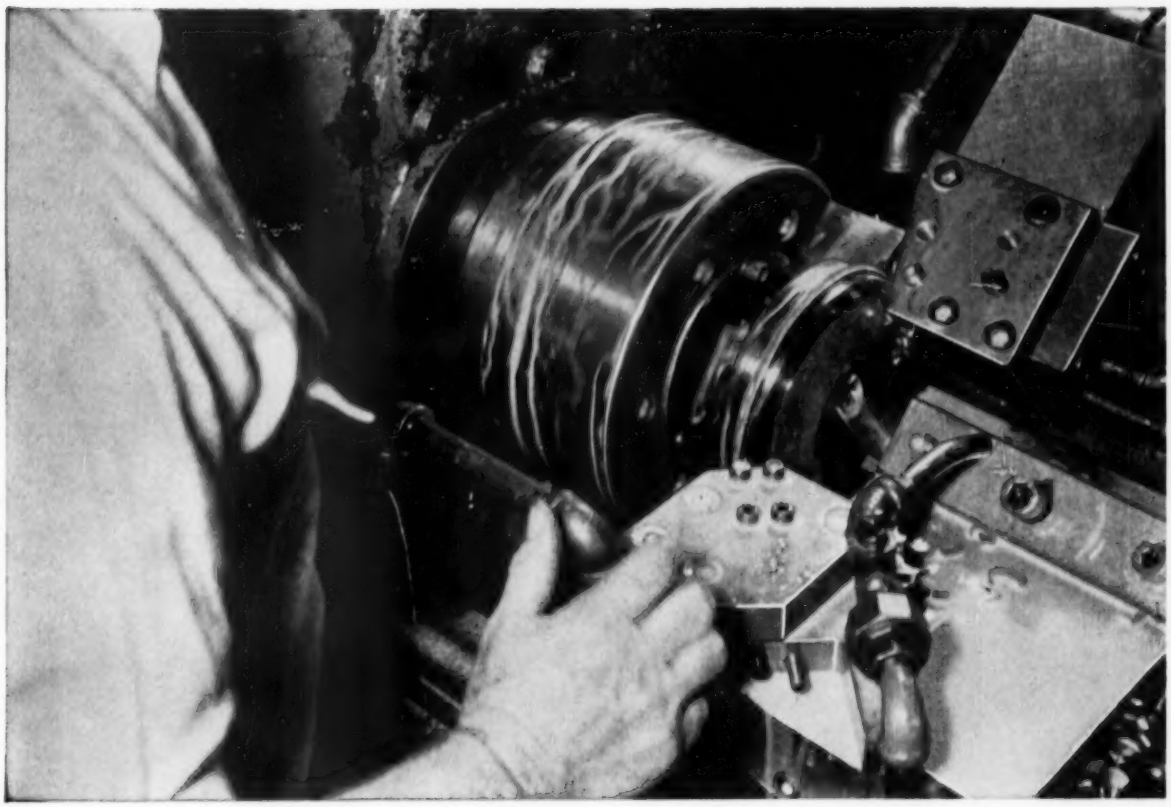
SETUP: Material – Rough Inconel X forging. **Speed** – 100 sfpm. **Feed** – 0.144 inch. **Depth of cut** – 3/16 inch. **Coolant** – Yes.

CUT MORE STEEL PER MINUTE WITH CARBOLOY



TURNING LANDING-GEAR PISTON. With regular carbides, Menasco Mfg. Co. was getting only one part per tool grind, with the job running at 170 sfpm. With Grade 350, speed was stepped up to 227 sfpm, tool life increased 6 to 1, and machine downtime decreased.

SETUP: Material – 4340 forged steel, heat-treated to 46 Rockwell "C." **Speed** – 227 sfpm. **Feed** – 0.010 inch. **Depth of cut** – 0.060-0.200 inch. **Coolant** – Yes.



EXTRA-PERFORMANCE GRADES 350 AND 370

- **Take heavier, deeper cuts without tip deformation**
- **Increase production up to 300% over other carbides**

Machining records in plant after plant show Carboloy Grades 350 and 370 consistently outperform conventional carbides . . . and far outwear them on the toughest jobs.

These grades cut more steel per minute, give more production per tool, increase machine efficiency. They outwear all other steel-cutting carbides, with less downtime for tool changes, and lower cost per piece.

Built-in structural rigidity

Carboloy Grades 350 and 370 are extra-performance carbides. Their superiority is due to the greater structural rigidity built-in by the Carboloy manufacturing process.

This process enables them to take deep, punishing cuts without the chipping, cracking, or cratering encountered in other carbides . . . even at temperatures as high as 1800° F.

No "equivalent grades"

Try heavy-duty Grade 370 and medium-duty Grade 350 . . . compare them with ordinary carbides on the toughest jobs. See why there are no "equivalent grades" to Carboloy 350 and 370.

Authorized Carboloy Distributors stock a complete line of Grade 350 and 370 tools, blanks, and inserts. Call them today; or for more information on these extra-performance carbides, send the coupon on page 4 of this advertisement.

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

CUT INDEXING TIME AND INSERT COSTS WITH EASIER-TO-USE CARBOLOY TOOLHOLDERS

- **Single screw indexes insert; automatically sets chipbreaker**
- **Carbide pad absorbs shocks; cuts throw-away insert costs**
- **New design reduces overhang; improves tool accuracy**

By simply adjusting a single screw at the top of the shank, the blank can be indexed while the Carboloy holder stays in the machine. The carbide chipbreaker is set automatically in the correct position.

Carbide pad cuts insert costs

Because the carbide pad absorbs shocks and gives greater rigidity, thinner, harder, more economical cutting blanks can be used. Machines operate at greater speeds and feeds; increase output at reduced cost.

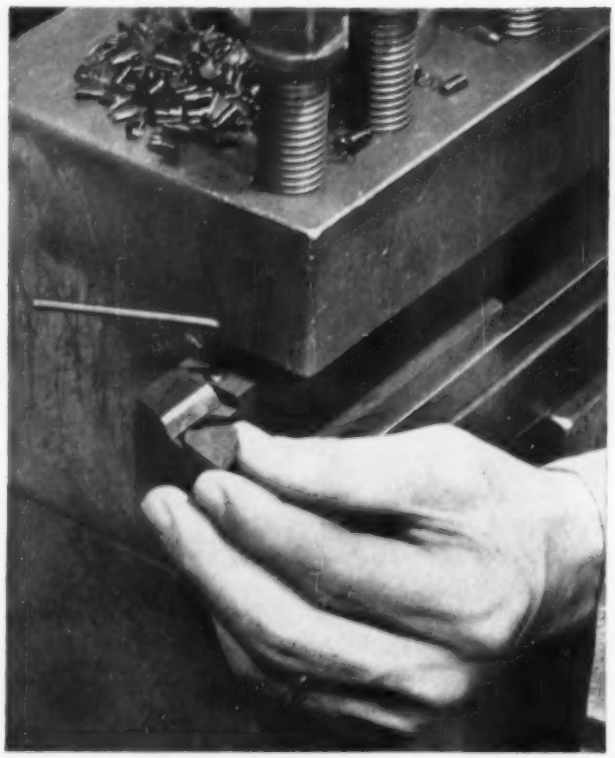
Carboloy design eliminates projections below the shank . . . reduces overhang, increases accuracy and rigidity. Minimum projection above the shank stops chip interference, protects clamp from abrasive chips.

Heat-treated shanks give the holders extra strength to resist deformation and chip wear.

Handle special jobs with ease

The Carboloy holder design is quickly adaptable to "specials" with cutting angles other than standard, and to positive or neutral rakes. New, compact design makes them especially efficient for gang tooling.

Available for round, square, or triangular blanks, the Carboloy holders are stocked in 7 styles and 52 sizes. New, heavy-duty holders are also available. For prices and specifications, send the coupon today.



New Carboloy Toolholders can be indexed quickly and easily . . . right in the machine. Chipbreaker is set automatically.

CARBOLOY

DEPARTMENT OF GENERAL ELECTRIC COMPANY

11149 E. 8 Mile Road, Detroit 32, Michigan

Send me information on these Carboloy products:

- ☐ Carboloy Machinability Computer
- ☐ Grades 350 and 370 steel-cutting carbides
- ☐ Carboloy Toolholders

Also:

- ☐ Have a representative make an appointment to demonstrate the computer
- ☐ Send the name of the nearest Authorized Carboloy Distributor

Name_____

Title_____

Company_____

Address_____

City_____ Zone____ State_____

"Carboloy" is the trademark for products of the Carboloy Department of General Electric Company

What do you think?

This standard 32-speed "AMERICAN" Hole Wizard Radial Drill head, in combination with a special drilling machine, has just completed the machining of 175,000 work pieces. The operations consisted of 6" diameter spot facing, drilling 5 holes ranging from 1.45" to 5" in diameter, step boring 3 holes ranging from 2.25" to 5" in diameter, two recessing operations and tapping 2.25" diameter holes.

In completing this job the tapping attachment frictions were engaged and disengaged well in excess of 1,000,000 times.

This entire operation was completed without one minute's down time and without maintenance or repair.

Although we have no data to substantiate this, we believe this *must* be some sort of a performance record.

What do you think? . . .

This is exactly the same type of head you get when you install a 32-speed "AMERICAN" Hole Wizard. What better guarantee of service could one ask than this performance record? This is the kind of service that has built "AMERICAN" prestige and preference and accounts for its world-wide reputation for top quality.

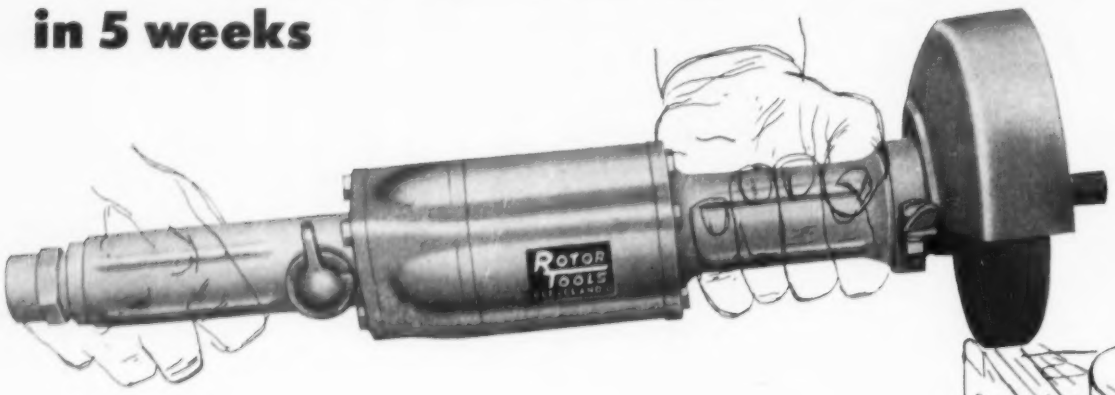
The many reasons contributing to "AMERICAN" Hole Wizard predominance are clearly illustrated and described by bulletin No. 327. May we send you one?

THE AMERICAN TOOL WORKS CO. **Cincinnati 2, Ohio, U. S. A.**

LATHES • RADIAL DRILLS

DOUBLES OUTPUT

New Rotor D-6 Air Grinder pays for itself in 5 weeks



JOB: Removing flash and parting lines from steel castings. Tool used 50% of production time.

FORMERLY: Used 6" electric grinders at 3700 rpm. Required 10 minutes per casting.

NOW: Using New Rotor D-6 Air Grinders at 6000 rpm. Job time cut to 5 minutes.

RESULTS: Output doubled. Savings paid for new Rotor Grinder in 5 weeks. Wheels last longer. Tool is 5 lbs. lighter, easier to handle.

A demonstration on *your* work will show how *you* can improve production with these new Rotor Grinders. Ask for proof.

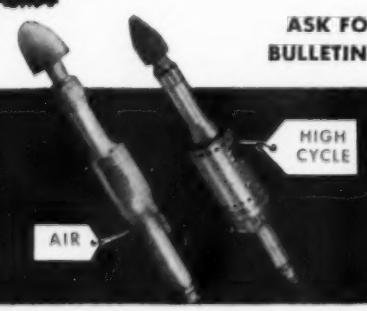
SPECIFICATIONS FOR ROTOR D-6

RPM	WHEEL SIZE		LENGTH†	WEIGHT*
	Elastic	*Vitrified*		
6000	6"	4"	22¼	9¼
4500	8"	5"	22¼	9¼
4100	8"	5"	22¼	9¼

* For D-6S straight handle. Add ¾ lb. for D-6G grip handle.
† Deduct 1½" for grip handle.

After 5 weeks, it's pure savings!

ASK FOR BULLETIN 44



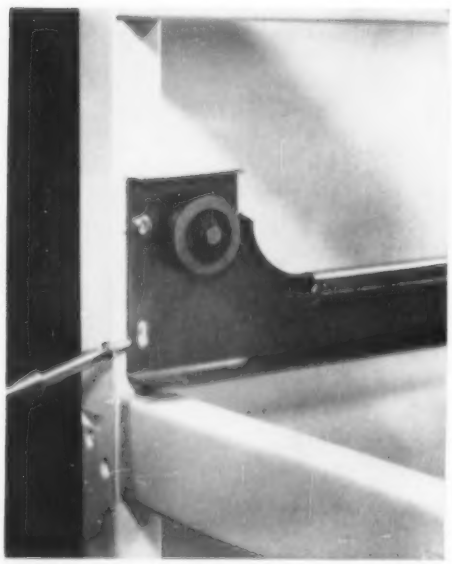
THE ROTOR TOOL CO.
CLEVELAND, OHIO
UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS

PHILLIPS CROSS RECESSED HEAD SCREWS

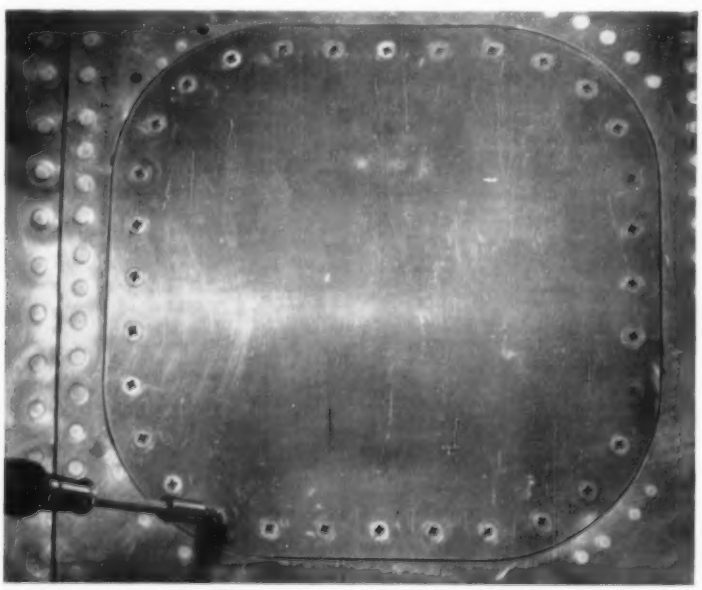
These fasteners of today — and of the future — are manufactured by the companies listed on the fourth page of this folder.

marks the spot . . . the mark of extra quality

INACCESSIBILITY of the screw location on this Stewart-Warner Corporation fuel valve unit is no problem with Phillips screws. "With our Phillips screws, the entire installation of six screws takes but a few seconds in almost effortless fashion," says Mr. Mosbarger, chief administrative engineer of the company.



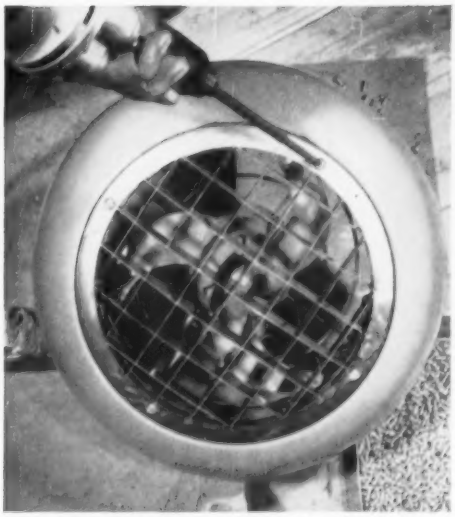
CONSTANT VIBRATION on this Tracy Kitchens drawer guide roller requires the tight fit afforded by Phillips screws. Mr. Krywick, general manager, says, "Phillips screws have eliminated costly redoing and increased production by enabling us to use power drivers."



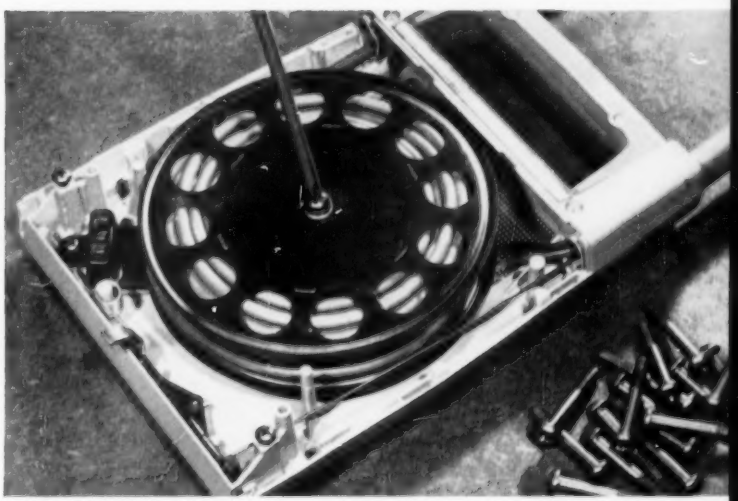
ACCESS PLATE on the Republic Aircraft Corporation's Thunderstreak is tightly fitted with Phillips screws. Phillips head screws give greater speed of assembly and positive gripping recess which prevents damage due to slippage.

Users Get Positive Gripping, Quick Assembly and Neat Appearance with

PHILLIPS CROSS RECESSED HEAD SCREWS



GRILL INSTALLATION of the A. C. Gilbert Company fan is made with Phillips screws. Mr. Morse, electrical engineer of the company, says, "We have learned that where tight fitting, neat appearance and speed of assembly is to be coupled with production efficiency Phillips head screws are the best we can use."



CORD REEL of the Singer vacuum cleaner is securely held in place with ¼" Phillips head fasteners. "With Phillips we maintain peak production," says Francis A. Gall, Vacuum Cleaner Engineer, "and greatly enhance the beauty of our new design with a flush-fitting installation."

ANODIZED ALUMINUM Phillips head screws are used to securely hold the Sargent & Company lock to the door. "With Phillips screws more positive engagement with the driver we are getting better fastening, less damage to the lock due to slippage," states Sargent Product Engineer.

• MANUFACTURERS OF • PHILLIPS CROSS RECESSED HEAD SCREWS

THE FASTENERS OF TODAY... AND OF THE FUTURE

marks the spot

... the mark of extra quality

Pledged to highest standards . . .

The Phillips Screw manufacturers listed here cooperate to turn out a uniformly high standard of quality. As sponsors of the Phillips Cross-Recessed-Head Standards Committee they adhere to the established dimensional standards, gauges, and gauging methods which will best serve industry.

Look to them for X*-tra quality Phillips Cross-Recessed-Head Screws*

AMERICAN SCREW COMPANY
Willimantic, Connecticut

ATLANTIC SCREW WORKS, INC.
85 Charter Oak Avenue,
Hartford 1, Connecticut

THE BLAKE & JOHNSON CO.
Waterville 14, Connecticut

CENTRAL SCREW COMPANY
3501 Shields Avenue,
Chicago 9, Illinois

CONTINENTAL SCREW COMPANY
New Bedford, Massachusetts

ELCO TOOL AND SCREW CORPORATION
Rockford, Illinois

GREAT LAKES SCREW CORP.
13631-51 So. Halsted Street,
Chicago 27, Illinois

THE H. M. HARPER COMPANY
Morton Grove, Illinois

THE LAMSON & SESSIONS COMPANY
1971 West 85th Street,
Cleveland 2, Ohio

NATIONAL LOCK COMPANY
Rockford, Illinois

THE NATIONAL SCREW & MANUFACTURING COMPANY
Cleveland 4, Ohio
Los Angeles 22, Calif.

PARKER-KALON Division General American Transportation Corporation
Clifton, New Jersey

PHEOLL MANUFACTURING CO.
5700 Roosevelt Road,
Chicago 50, Illinois

SCOVILL MANUFACTURING COMPANY
Waterville 14, Connecticut

SHAKEPROOF Division Illinois Tool Works
2501 North Keeler Avenue,
Chicago 39, Illinois

THE SOUTHINGTON HDWE. MFG. COMPANY
Southington, Connecticut

STERLING BOLT COMPANY
363-405 West Erie Street,
Chicago 10, Illinois

WALES-BEECH CORPORATION
2240 Fifteenth Street,
Rockford, Illinois

4.6.4 Printed in U.S.A.

Members Screw Research Association

FRACTIONAL HORSEPOWER GEARING

GS

40 Years of Specializing in Small Gearing!

YOU'LL FIND G. S. GEARING IN TOP QUALITY PRODUCTS LIKE THESE....

Aircraft Carburetor & Fuel Metering Systems • Aircraft Instruments & Radios • Automatic Musical Instruments • Business Machines • Clippers for Barbers, Animal Shearing & Hedge Trimming • Communication Equipment • Electric Fans • Electric Motors • Floor Polishers, Scrubbers & Sanders • Meat Tenderizers, Grinders & Slicers • Military Equipment • Motion Picture Equipment • Outboard Motors • Pneumatic Production Tools • Portable Electrical Tools • Radio Dials • Sewing & Cloth Cutting Machines • Steelstrap Stretchers • Step Switches • Vending Machines.

FOOD AND DRINK MIXERS RUN SMOOTHER WITH G. S. SMALL GEARING

America's biggest buyers of components for home appliances invariably specify "G. S." for all the Gearing they need. Makers of high quality drink and food mixers with power unit attachments have found, through the years, that G. S. Small Gearing runs smoother, quieter, *longer!* And assembly costs are less because *every single Gear,* in runs of hundreds or thousands measures up to the most exacting specifications. ★ Here at Small Gearing Headquarters, you, too, can depend upon getting *extremely accurate* top quality Gearing in each succeeding shipment. And as a bonus, you get all the unique skills and experience gained through 40 years of intensive specialization in mass producing *only the best* Fractional Horsepower Gearing *exclusively!* Will you write us now? Send drawings or details covering exactly what you need. Our capable engineers will be happy to help you.

GEAR
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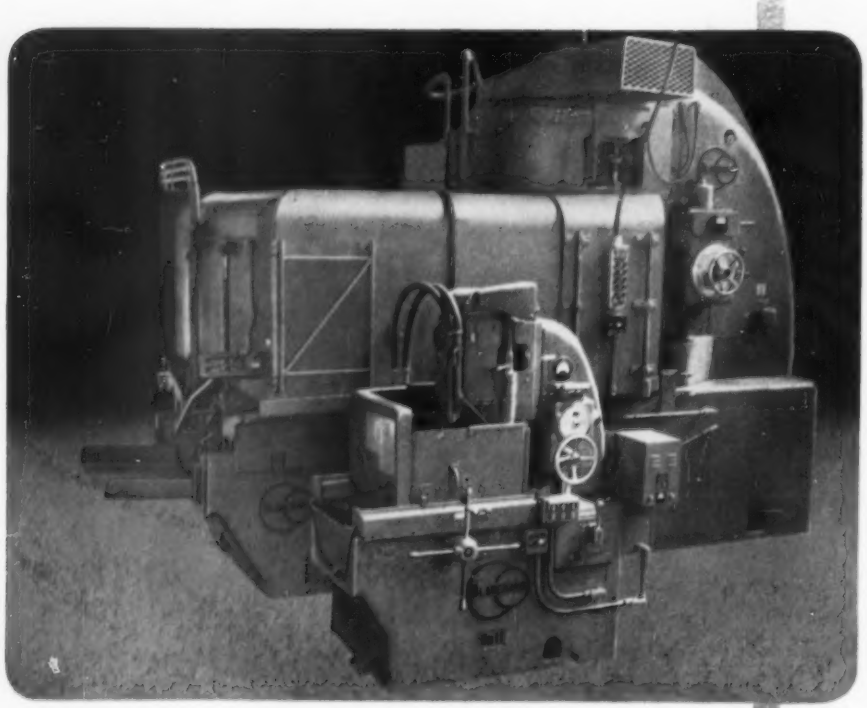
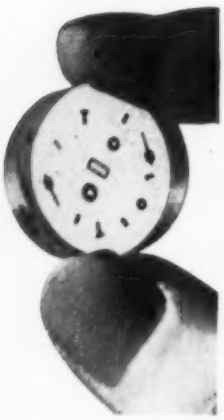
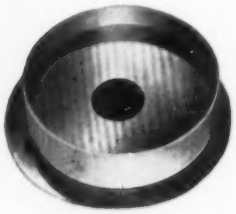


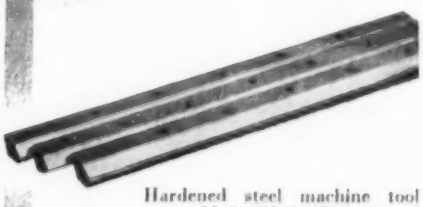
V-488



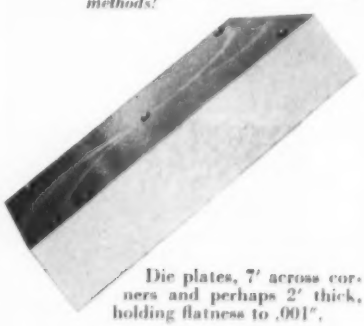
Tiny watch gears, pinions and ruby bearings — flat and parallel — to a dimension tolerance of .0002".



To 3 micro-inches and flat within *one* light band.



Hardened steel machine tool ways, 2½" x 3½" x 50", ground on 6 sides, flat within .001" with surface finish of 5 micro-inches — *5 times faster than other methods!*



Die plates, 7' across corners and perhaps 2' thick, holding flatness to .001".

Please give us a chance!

We *know* we can do *your* flat surface jobs. We've done them all — tiny watch parts . . . steel plates 7 feet across corners . . . copper and ceramics . . . *perfectly*. Just give us the correct wheel . . . (Blanchard wheels are preferable).

Blanchards regularly grind surfaces flat to within 2 to 4 light bands, parallel to less than .0001", with dimension tolerance of .0002" and surface finish to better than 3 micro-inches.

Honest, we Blanchards (15 models) work fast and inexpensively — whether the job requires precision grinding or rapid removal of stock. Give us a chance to prove we're the best investment you ever made.

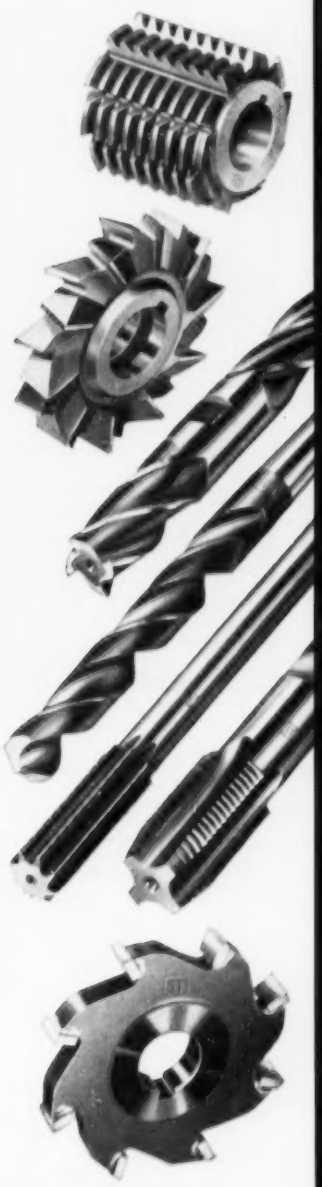
Send for free copies of "Work Done on the Blanchard" (fourth edition), and "The Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

THE BLANCHARD MACHINE COMPANY

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

Standardize with STANDARD



YOUR STANDARD TOOL DISTRIBUTOR STOCKS THE COMPLETE LINE

● Helping you solve tough metal-cutting problems, speed up production, cut tool costs...these are the STANDARD TOOL MAN'S services to you.

His recommendations have 75 years of industrial experience behind them and are yours without obligation.

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now you can save valuable

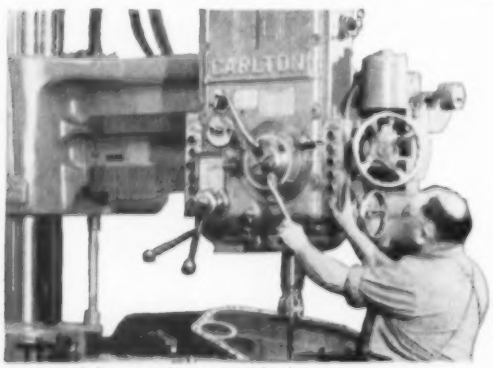
one operation ahead . . . with

Carlton

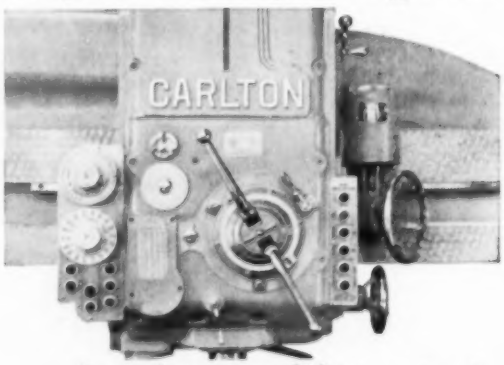
The Carlton-Leber speed-feed pre-selector system speeds up drilling by permitting operator to set speed and feed for the next operation while the machine is still under cut. With this productive new device, the time lost heretofore in setting speeds and feeds is now used for almost continuous drilling. Now you stop the spindle only for changing cutting tools.

Pre-selector Here's how it works: while the machine is cutting on one operation, the operator sets speed and feed dials for the next operation. When present operation is complete, he stops the

Carlton Radial Drills now come with your choice of 3 different



1 ***Manual gear shift:*** 2 shifter levers for controlling speeds, 2 shifter levers for controlling feeds.



2 ***Pre-select gear shift:*** 1 speed graduated dial and 1 feed graduated dial pre-set speeds and feeds.

drilling time by giving operator a chance to set

ingenious

pre-selector

spindle, changes the drill, and starts spindle again. At that instant, the gears automatically shift to the correct speed and feed.

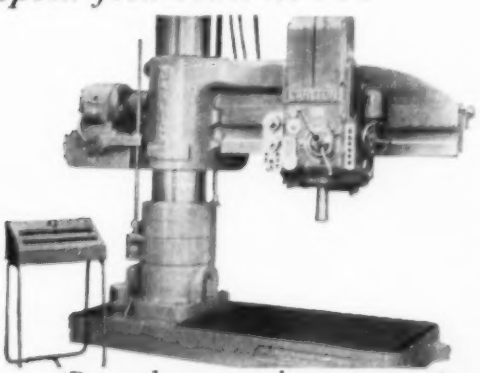
Additional time is saved by instantaneous gear shifting made possible by mechanically oscillating the change gears which assures quiet gear mesh.

Programming Another Carlton-Leber system —the programming unit—can be used in connection with the pre-selector. The programming system pre-selects speeds and feeds for an entire drilling program including as many as 20 or 30 operations.

With the introduction of the Carlton-Leber pre-selector and programming systems, you can now buy Carlton radial drills with your choice of three different types of speed-feed control as illustrated below.

You can see the pre-selector and programmer in operation. Ask your Carlton distributor to arrange a showing of the new Carlton movie. Or, write us direct for descriptive free bulletin. The Carlton Machine Tool Co., Cincinnati 25, Ohio, U.S.A.

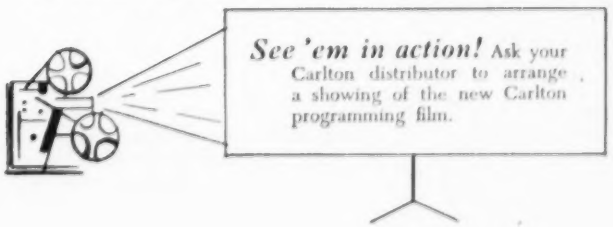
speed-feed controls . . .



3 ***Pre-selector and programming gear shift*** sets up correct speeds and feeds for a complete sequence of operations.

Carlton

horizontal and radial drills



Madison Men cover every

Here's how **MADISON** *can solve your hole problems*

MADISON applications

MADISON range

Diameters 1" up

Diameters 5/8" up

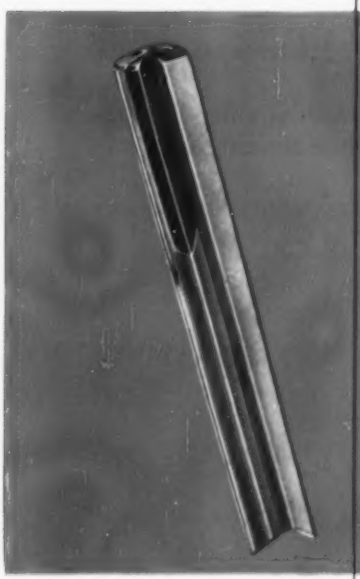
typical MADISON tools

For rough boring, MADISON Roughing Bars are available in sizes to properly handle the complete range of MADISON Rough Boring Cutters. Only MADISON features Free Cutting Action and One-Screw Adjustment.

For finishing a hole to size with close tolerance and good finish, use the MADISON Reaming Tool. The MADISON feature of Interchangeability and Controlled Float are inherent in every MADISON Tool.

You buy more than just hole-making tools when you buy MADISON Tooling. You get the knowledge and experience of MADISON'S veteran tool engineers. This service is available to you at all times. These experts, whose chief concern is inner diameters, are on the job to lower tool costs and increase production for you. To get their unbiased recommendations, submit a part-print or sketch of hole problems. The men with holes in their heads will then see to it that you get the right MADISON tool for your applications.

phase of **Inner Diameters**

Diameters 5/32" to 2"	Diameters 2" up	Diameters 1/4" to 12"	Diameters 3/4" up
			
For producing truer, more accurate, finer finished holes, in one operation from the solid through gun-drilling techniques, use MADISON Deep Hole Drilling Tools. Unexcelled for both deep and shallow drilling applications.	Where relatively large diameters are to be produced from solid stock, use MADISON Trepanning Tools. Through solid-core removal, faster cycle time, saving of material and reduction of horsepower requirements are realized. Depth of hole is unlimited.	To obtain a mirror-smooth burnished surface in any cylindrical bore, regardless of length, use MADISON-FAESSLER Roller-Burnishing Tools. Micrometer adjustment. Self feeding. Quick, simple operation.	For checking the accuracy of the hole produced, use MADISON Adjustable Boregages. Sets available in individual combinations or to cover the complete range of holes. Speeds gaging operation, cuts gage inventory cost. Ease of setting provides rapid change in size or tolerance.

MADISON

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Get the Hole Story at the

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MADISON BOOTH – No. 1209

Qualified MADISON representatives will be in attendance throughout the entire show to discuss with you any hole problems, whether in the planning stage or in production. You'll also see representative tools of MADISON'S complete line.

See "Magnamatic" at the THREADED

CAPACITIES:
#4 screws
to 3/8" bolts

Reversible
and non-reversible
types

When you're at the Tool Show, be sure to visit the Chicago Pneumatic Booth and "bone up" on Magnamatic . . . the One-Shot air-driven screwdriver-nutrunner that can be preset to run threaded fasteners to precise torque . . . *and it's quiet!*

You'll see how Chicago Pneumatic One-Shot Magnamatic screwdriver-nutrunners *cure* these assembly problems:

- Fasteners driven too loose or too tight
- Distorted or damaged components
- Marred work surfaces and finishes
- Loss of adjustment or calibration in sensitive instruments after fasteners are driven
- Excessive bit breakage
- Constant need for tool service or adjustment
- Nerve shattering exhaust noise or clutch buzz and chatter

And while you're there pick up a Magnamatic screwdriver and get the "feel" of its "One-Shot" Alnico magnetic clutch action as it disengages the *instant* the fastener is driven to desired tightness. Ask for a copy of our Magnamatic Case History Booklet or mail the coupon to learn how 19 companies proved Magnamatic "One-Shot" clutches cut rejects, step up production and reduce noise levels.

Chicago Pneumatic

Pneumatic Tools • Air Compressors • Electric Tools • Diesel Engines • Rock Drills • Hydraulic Tools • Vacuum Pumps • Aviation Accessories

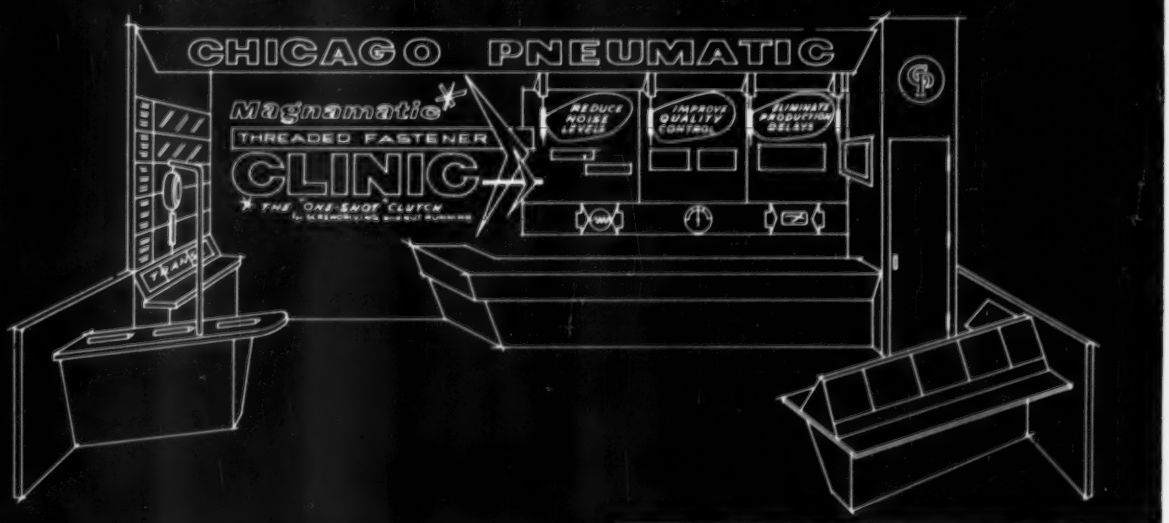
screwdrivers and nutrunners
FASTENER CLINIC

"Magnamatic"
REDUCES NOISE LEVELS
caused by exhaust or ratcheting

"Magnamatic"
IMPROVES QUALITY CONTROL
Drives fasteners . . . "not too loose, not too tight . . . but just right"

"Magnamatic"
BOOSTS PRODUCTION
by eliminating "time-outs" for clutch adjustment and bit breakage

BOOTH #1321 AT THE ASTE SHOW



Chicago Pneumatic Tool Company, Dept. M-25
8 East 44th Street, New York 17, N. Y.

- ☐ Please send me FREE booklet SP-3165 "Magnamatic Case Histories."
- ☐ Please send me Magnamatic Bulletin SP-3126.
- ☐ Have Representative call.

Name _____ Title _____

Company _____

Address _____

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If you really want to trim costs...

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Minute Man
KEYWAY BROACH KITS

For cutting keyways from 1/16" to 1" in any bore from 1/4" to 3" in *one minute* for as little as *one cent*.

Minute Man
SQUARE BROACHES

For finishing cast or drilled holes in one pass. In stock for 1/16" to 3/4" squares. Hexagon broaches and Production Type Keyway Broaches also in stock.

duMONT
TOOL BITS

High Speed Ground, Square and Rectangular. Hold a keener cutting edge longer due to "balanced" toughness, red hardness and wear resistance.

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MAGNETIC BASES

Hold dial indicator gages — save set up time. Alnico magnet has 50 lb. grip on all four sides. 360° horizontal swing, 180° vertical swing.

The duMONT CORPORATION
Greenfield, Massachusetts

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Name .....

Company .....

Address .....

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Help Yourself

I sometimes find things in your Practical Ideas pages that I would like to make and sell as commercial items. Some of them have real possibilities. But before I do this I would like to know whether they are patented and if I would have to pay any kind of a fee to the person whose name is on the item.

R S McLeish
Glasgow, Scotland

To the best of our knowledge, these ideas are not patented, but we cannot guarantee this. Before undertaking commercial manufacture, it would be advisable to make a Patent Office search because it would be quite possible for the author to have copied the idea in all innocence from someone who had, himself, copied it from a patented device. For a non-patented idea, you would not be under any obligation to pay a fee to the author.—Ed.

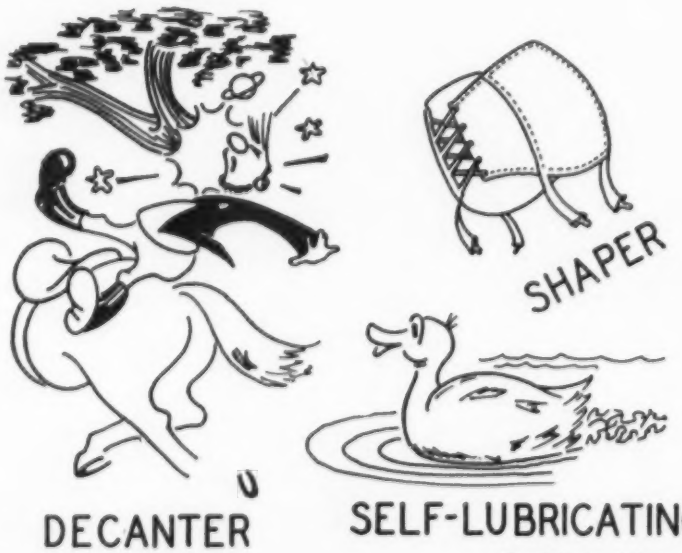
Let's Do It Right

Automation has become standard practice in many machine operations which were formerly done by hand. This should mean that the products we buy are more nearly perfect than ever before. Unfortunately, it does not always work out that way. Nor is it likely to do so until all assembly is automated, too. However, it is not easy to see how this may be applied to the finishing of a complete automobile.

Any automobile dealer who knows you well enough to be honest with you will tell you of his troubles with new cars received from the factory. There is an allowance made for putting cars in running order after they reach the shop—and this is not confined to the so-called low-price cars. As a glaring example, a dealer in one of the best known and highest-price cars told me that not only were several bolts missing, some in important places, but several important screws for holding on the chromium trim were also lacking. It is hard to see how such obvious errors could get by even a most casual inspection.

GRINETICS

By D G SMITH



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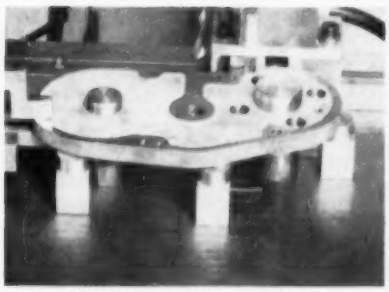
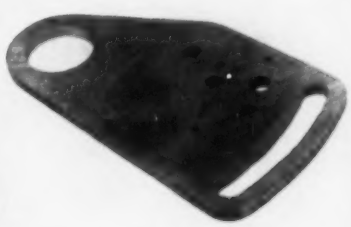
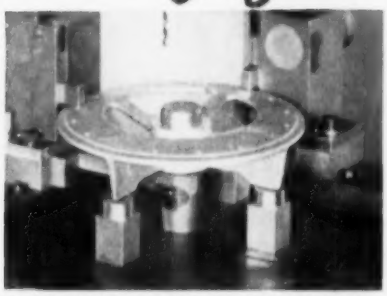
DRILL PARTS LIKE THESE . . . *Without Jigs!*



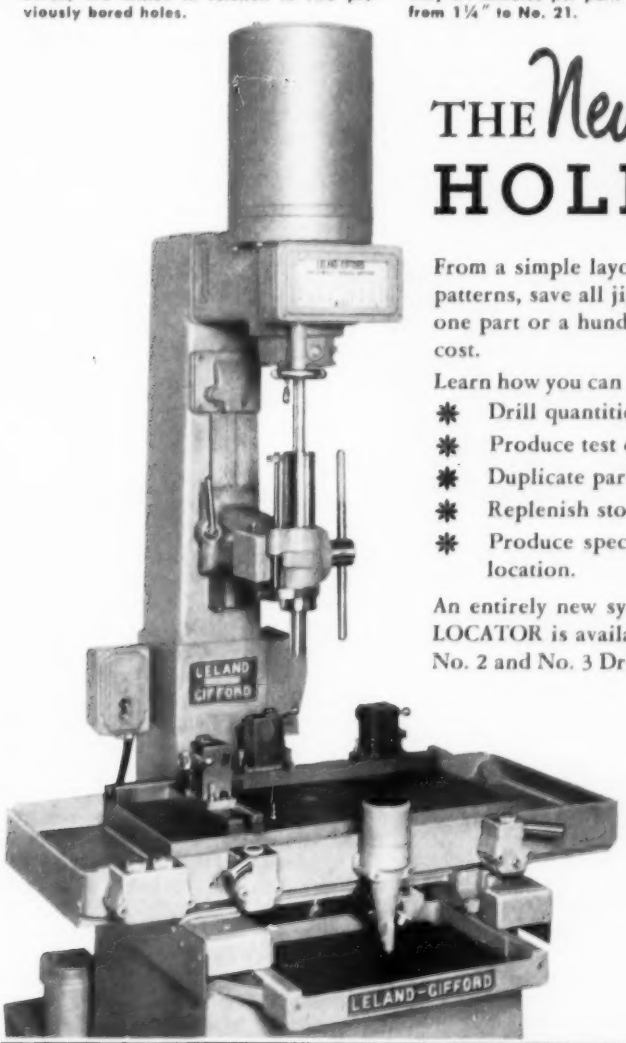
Thirteen holes (4 tapped, 1 reamed, 4 counterbored) are drilled in relation to two previously bored holes.



Nine holes plus five extra operations take only 24 minutes per part. Hole sizes range from 1¼" to No. 21.



Twelve holes are drilled and tapped in this aluminum motor fan in precise relation to the hub and webs.



THE *New* LELAND-GIFFORD HOLE LOCATOR

From a simple layout chart, you can locate and drill complex hole patterns, save all jig costs, eliminate piece by piece layout, produce one part or a hundred in a fraction of the time, at a fraction of the cost.

Learn how you can use the new Leland-Gifford HOLE LOCATOR to:

- Drill quantities of parts not requiring jig borer accuracy.
- Produce test or experimental pieces.
- Duplicate parts for repair or maintenance.
- Replenish stocks of replacement parts.
- Produce special parts requiring modification in hole size or location.

An entirely new system for locating and drilling holes, the HOLE LOCATOR is available in the capacities of standard Leland-Gifford No. 2 and No. 3 Drilling Machines. Write for complete information.

HOW IT WORKS

Hole locations are precisely established from intersecting lines scribed on a metal chart from blueprint dimensions. An optical viewer with double cross hairs and 20X magnification aligns the table with the layout chart which is registered in relation to the machine spindle. Dual locks release to permit lateral, forward and back, or compound motion of the table. The work is held on the table by quick-acting clamps. Duplicate parts can be produced from the same layout or the chart can be filed for future use.

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Drilling Machines

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South Orange, N. J.
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ROCHESTER 12, P. O. Box 24, Charlotte Station

Westinghouse Electronic Air Cleaner Eliminates Coolant Oil Vapor... Pays for Itself in Savings:

- ★ Improved Working Conditions
- ★ Slashed Fuel Bills
- ★ Increased Production
- ★ Salvaged Coolant

Ask for Catalog 1450. Westinghouse Electric Corporation, Sturtevant Division, Dept. 26C, Hyde Park, Boston 36, Mass.

WESTINGHOUSE AIR CLEANING

YOU CAN BE SURE...IF IT'S Westinghouse

J-80457

In the case of a medium-price car, the bolt holding the rod to the steering knuckle dropped out on the road and the front wheels spread-eagled and stopped the car suddenly. Fortunately there was no car immediately behind, or a bad accident might have resulted.

Parts may be made with the greatest precision, but the service of the cars depends on how they are assembled. I have seen connecting rods bolted on the crankshaft and tested by moving the rod on the pin. If too tight, they did not take the rod off and use a shim; instead, the assembler belted the rod cap with a hammer until the rod would turn freely. A dealer friend told me recently that he had seen the same thing in the plant of the car he sells. Nuts not properly tightened, or omitted altogether, are a menace to the user of the car. As an old driver said the other day, "It wouldn't be so bad if they only told you what bolts they had left out."

What we seem to need is automated assembly of the complete car, but perhaps it would be cheaper to train men to do the job properly and have *real* inspection before the cars leave the plant.

Fred H Colvin
Point Pleasant, NJ

Take Heed Lest Ye Fall

Your recent editorial (*AM*—Feb 13 '56, p119) is indeed the "Voice of one crying in the wilderness." Let us hope that it will fall upon more receptive ears than did the original Voice. How much longer is the American people to be lulled into false security by the complacent do-nothings who smile tolerantly and say that the poor ignorant Russians can never even approach the achievements of the American super-race?

Have we forgotten how we used to smile at the "stupidity" of the Japanese and dismiss them as mere copyists, incapable of original thought? If we have, let us remember what their "copying" did to us in the South Pacific.

We dismiss the pride of the Russian automobile industry as "just a copy of a 1938 Packard." So what? The 1938 Packard was a mighty fine automobile and, as far as stamina and life expectancy are concerned, would far outlast the glittering, overpowered, christmas-tree models produced today.

You say well that they are no dopes, and I can well imagine the chuckles of satisfaction that echo

through the Kremlin every time they read our smug statements that we are "far ahead" of their developments. They are smart enough not to tell all they know, and unless we continue to drive forward into new fields we may one day learn to our sorrow that they know more than we believed.

Henry W Barlow
Cincinnati

Missing

What's happened to Talking Shop? It's the first thing I look at in each issue, and I missed it in Dec 5 and again in this issue (Feb 13). It is always good for a chuckle or a surprise. I hope you are not planning to drop it altogether and are trying to get us used to it by leaving it out of more and more issues.

Henry Wallenstein
Little Rock

No, we are not planning to drop it; it just happened that we needed the space for some last-minute article that we felt would be of more importance to you. It is sometimes a tough job to find items to go on the Talking Shop page, but we manage to do it and are glad to hear that it is so well liked.—Ed.

Them's Fighting Words

What are those Maine lumberjacks trying to do? (*AM*—Feb 13 '56, p98) Start another war between the states? It just shows the ignorance of those Yankees who believe all they see in the funny papers. We have had industry in the South for a hundred years and more, while they were chopping down trees and catching lobsters. The proof of the pudding is in the eating, and if manufacturers didn't believe they could get top-grade workers in the South they wouldn't have built their new plants here.

The root of the whole matter is jealousy. Maine has never had any real industry, but as soon as they see us beginning to expand ours a little they get all excited about it. If they had even shown they had the ability, as we have done, they might have been able to entice some industries to get into their fur coats and snowshoes and start producing. They are still waiting for opportunity to knock; we went out and dragged it in by the coat-tails.

M A Lawrence
Marietta, Ga

ACCO products

Wilson "Rockwell"* Hardness Testers

Is HARDNESS an important factor in your business?

• If your business involves metals, successful operation often requires *exact* knowledge of the proper hardness of the materials you make or work with.

In heat treating departments

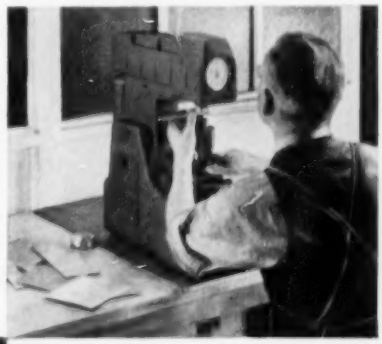
WILSON "ROCKWELL" testing of hardened and tempered steels is universal.

In metallurgical laboratories

They provide means for establishing thousands of hardness specifications.

In the tool room

They are relied upon for absolute guidance as to the hardness of tools and the metals to which they are applied.



In the inspection department

Inspection of parts to see that they actually meet specifications is an important use of WILSON "ROCKWELL" hardness testers. On the inspection line they help insure the quality of the product, reduce defects, and retain the good name and reputation of the manufacturer.

In the production department

WILSON "ROCKWELL" hardness testers are ideal for use in production testing. The test, complete from work insertion, loading procedure, feeding, removal of work piece—is a matter of three to five seconds depending on the skill and dexterity of the operator.

• For complete information on "WILSON ROCKWELL" Hardness Testers call or write today. There is a WILSON model to meet every testing requirement.

**Trademark registered*

See the WILSON line at BOOTH 909 at the ASTE Show, Chicago, March 18-23

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Wilson Mechanical Instrument Division
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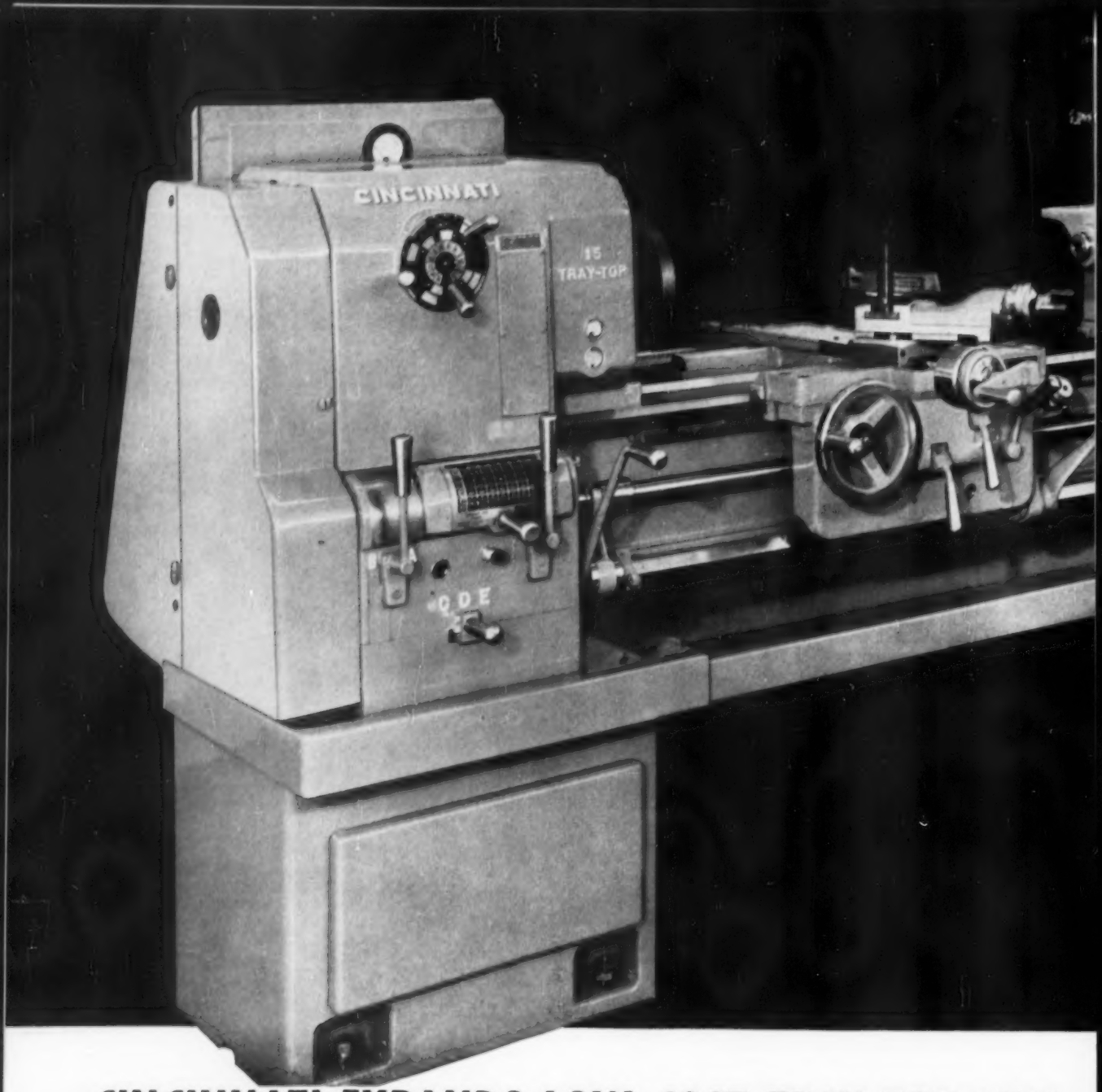
230-B Park Avenue, New York 17, N. Y.

for Better Value

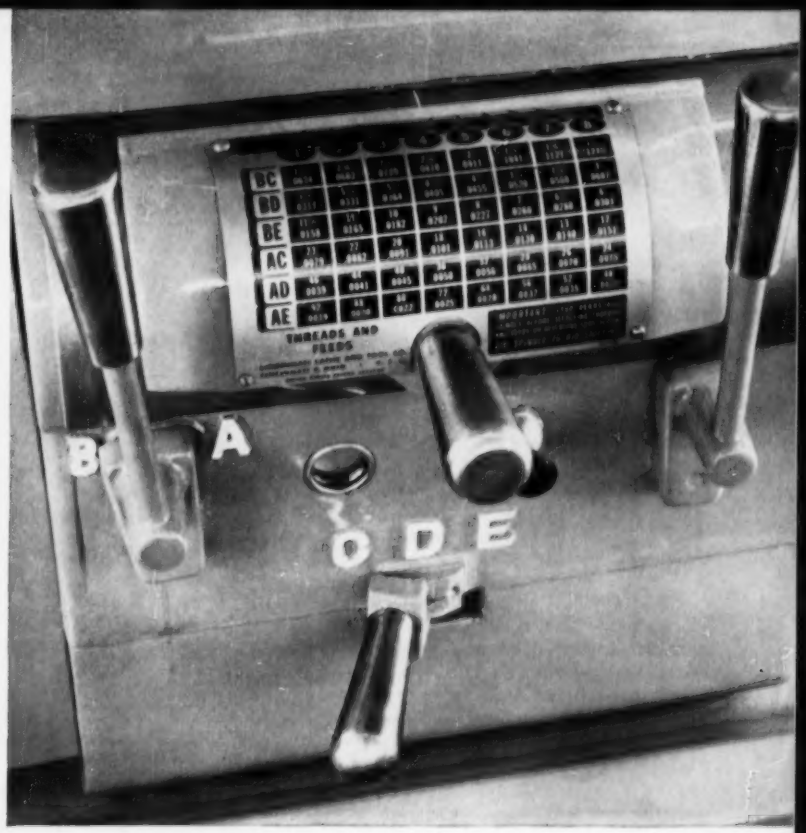


CINCINNATI EXPANDS LOW-COST TRAY-TOP LINE —NOW THERE ARE SIX NEW LATHES

The good news here takes two directions: (1) Cincinnati Tray-Tops are available now in 10″, 12½″, 15″, 18″, 21½″ and 26″ sizes, and in engine, toolroom and fixed gap bed models. (2) The complete Tray-Top line is designed to provide *new* production convenience and *new* operator safety.

To job shops, maintenance shops, schools and production shops, the new, complete line of Tray-Tops means that the majority of jobs can now be done on modern standard machines at a modest primary investment.

In every respect, Cincinnati Tray-Tops are precision machines, built to hold their accuracy through years of continuous hard work. Your local Cincinnati dealer will explain the solid business advantages you get with Tray-Tops. For the name of dealer nearest you, plus complete catalog material, write Cincinnati Lathe and Tool Co., 3243 Disney, Cincinnati 9, Ohio.



TOTALLY ENCLOSED QUICK-CHANGE BOX guards gears against dirt, chips and foreign matter. 54 thread and feed changes: range of 1¼ to 92 threads per inch; range of feeds, .0019 to .1215.

COLOR-MATCH SPEED SELECTOR is simplicity, itself. No more reference to index plates and lever positions; just match up the color lines. Standard spindle speed ranges are 35 to 1200 rpm; 25 to 980; or 16 to 640; with higher ranges available at extra cost. Pressurized lubrication to bearings and gears. Three-bearing spindle. 3″ diameter spindle hole available on larger sizes.

Get your Cincinnati Turning Calculator now or during the MACHINE TOOL SHOW at BOOTH 309

With this new, attractive calculator, complete with instruction booklet—

IT'S EASY

. . . to select speeds and feeds for your job lot, toolroom or initial production runs.

IT'S SIMPLE

. . . to determine the most economic cutting speed for your high production runs.

JUST

. . . print your name, firm, address, city, zone and state, and mail with $1 (check or money order) to Cincinnati Lathe and Tool Co., Cincinnati 9, Ohio.

Cincinnati Lathe and Tool Co., Cincinnati 9, Ohio, U.S.A.

Enclosed is $_____ in payment for _____ Cincinnati Turning Calculator. Please ship to:

Name _____

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You'll Be Glad TOMORROW

1956 1957 1958 1959 1960 1961 1962 196

NEW 46" KING
VERTICAL BORING &
TURNING MACHINE
with Turret, Ram,
Side Head, and
Coolant Pan

You Chose The New KING TODAY!

The all new KING® Vertical Boring & Turning Machines have been completely re-designed and re-engineered to take maximum advantage of new cutting tools, materials, and methods—not only those of today but those which, along foreseeable lines of development, will likely become available during the years ahead.

The result of this "forward look" is a line of machines with highly advanced features designed to bring to boring mill users the *ultimate obtainable productive capacity*—for today *and* for tomorrow.

Prominent among these new features providing stepped-up production rates, greater ease and speed of operation, and simplified maintenance, are the following:

INCREASED HORSEPOWER:
40 to 50 H.P. on 30" to 46" sizes. 75 to 100 H.P. on sizes 56" and up.

EXPANDED FEED AND SPEED RANGE:
24 feeds from .0016 to .250 per revolution. 24 speeds in any one of three standard ranges: low, intermediate, or high.

COMPLETE ELECTRICAL CONTROLS
—conveniently located on moveable pendant and on fixed panel mounted on side head.

DIRECT-READING FEED AND SPEED SELECTION DIALS.

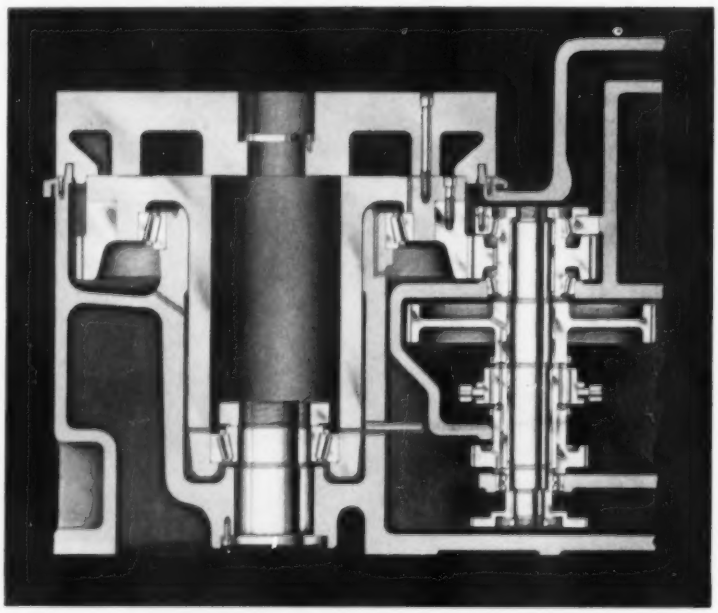
UNIT CONSTRUCTION OF SPINDLE DRIVE
—permitting removal as a single unit for easy maintenance.

AUTOMATIC LUBRICATION OF ALL MOVING PARTS.

MACHINE ADAPTED FOR OPTIONAL ADDITION OF:

- Automatic positioning of heads
- Automatic cycling
- Power rail clamping
- Power indexing of turrets
- Automatic tracing control of heads

These are just a few of the reasons why *you'll be glad tomorrow you chose the new KING today.* For further details consult the King Distributor in your area, or write us direct.



OUTSTANDING NEW SPINDLE AND MOUNTING PROVIDES MAXIMUM TABLE STABILITY, ACCURACY

Substantially increased accuracy of spindle operation is assured by many improved construction features. As indicated in drawing above, the spindle itself is extra heavy and rigid. Tapered roller, preloaded bearings are placed so as to provide extreme stability and accuracy. Adjustment of the bearings as well as removal of the spindle assembly are quickly, easily accomplished. Helical gear spindle drive completely eliminates any tendency toward spindle deflection. The lubrication system is automatic and safety inter-locked.

AMERICAN STEEL FOUNDRIES, KING MACHINE TOOL DIVISION
1150 TENNESSEE AVENUE, CINCINNATI 29, OHIO

KING Vertical Boring and Turning Machines

Spot News of Metalworking...

- **Wayne Society of Skilled Trades, UAW splinter group** recently recognized by the NLRB, is seeking the right to bargain for workers at Burroughs Corp, where 75% of the company's Detroit area skilled employees are members. The Society reports 20% membership of skilled workers at Ford's Rouge plant, and 80% of Chrysler's Trenton Division — mostly ex-UAW men.

- **The City of Phoenix, Ariz, is lending Sperry Rand Corp a 41-acre site** for its new electronics plant. But — Phoenix gets an annual rental of $15,000 from Sperry-Rand, and the company must turn over all buildings on the property at the end of the 20, 40 or 50 (it's undecided) lease period.

AFL-CIO will launch its nationwide campaign for a 35-hr workweek in Southern California's aircraft plants, with International Association of Machinists locals as the icebreakers. First targets: Convair San Diego, Douglas's El Segundo-Torrance, Calif, plants.

- **Ford will break with two new cars by mid-1957,** both carrying the same nameplate, but of different sizes. The smaller will compete with Pontiac, falls between the Ford and Mercury size. The other, between the Lincoln and Mercury, is slated to compete with Buick and Oldsmobile.

- **You'll have to give 90-days' notice of intent to merge** to the FTC and to the Justice Dept if a bill now up in the House is passed. The bill applies only where combined assets of merging firms total $10 million or more. If, during the 90-days, the government decides you're violating anti-trust laws, it'll have to get a court injunction to prevent the merger.

- **"$1 buys any machine tool at the completion of our 3-year rental plan"** is the current offer of one large Eastern used machinery dealer.

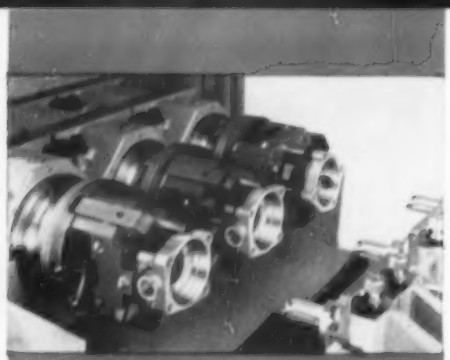
- **Alkaline derusting process for cleaning ferrous parts before plating** or other processing has been developed by the Army's Rock Island Arsenal. It can be used hot or cold, with or without electric current, also cleans brass, magnesium, and strips off phosphate coatings and paint.

Russia has set up a Ministry for Automation to work closely with its Ministry of Machine Building in designing new machinery to speed mechanization of production processes. Large-scale automation, the Russians say, will increase productivity and contribute to easier working conditions. To provide technicians to carry out the program, technological training will be intensified.

- **Steel founders will spend $100,000 in looking for an inorganic bond,** other than clay, that will (1) produce a strong, accurate mold, (2) will be effective at temperatures to 315 F, (3) allow rapid mold curing, (4) make molds lose brittleness at high temperatures but hold their shape and disintegrate easily after casting, and keep the mold and bond gas-free. Bond must also allow moldmaking at room temp by ramming, blowing, or slurry molding.

- **Continent-wide norms for automotive accessories will begin in Europe** this month when Austria, West Germany and France complete negotiations.

- **Non-profit agency to furnish tests for aviation materials** has been proposed by Northrop Aircraft engineer Charles M Miller. Outfit would draw up lists of approved materials and specifications based on data supplied by independent test labs. SAE is quizzing its members on plan's feasibility.



Showing parts mounted in the chuck. Without chuck changes, any of three parts having different exterior forms but identical interior contours can be accommodated.

Heavy lines denote surfaces machined. 12 operations are performed in one machine cycle.

INTRICATE CONTOURING IS FAST, ACCURATE ON

Ex-Cell-O's Cam Operated, Precision Boring Machine

Direct cam action—no levers—provides Ex-Cell-O Precision Boring Machines with better accuracy, versatility, speed and flexibility in difficult contouring operations.

In the application shown here—contouring an internal form in die-cast aluminum end covers—limits on diameters are held as close as plus or minus .0005 inch, and three work pieces are completed at a time. 12 separate operations are performed in one machine cycle, including precision boring, facing, chamfering and grooving.

Cams can be changed in minutes. Cam assembly swings out for quick, easy change of operation. All motors are outside the base.

Another Ex-Cell-O feature is the large chip chute, cast as an integral part of the base. There are no openings where chips or coolant can enter the base.

Contact your Ex-Cell-O representative or write direct for complete information.

EX-CELL-O CORPORATION

DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING SPINDLES
CUTTING TOOLS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS
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56-7

XLO

The Ex-Cell-O Style 312 Precision Boring Machine is operated by *precision* direct cam action. Because of the demand for this type of machine, a smaller model, the Ex-Cell-O Style 308, is now available.

Washington . . .

Labor unrest on rise . . .

Surprising resistance to union demands by management foreshadows trouble on the labor front as the mid-summer contract peak approaches. What had been anticipated as a peaceful year with big settlements has erupted in a key strike by the AFL-CIO Machinists at Republic Aviation Corp's Farmingdale, L I, plant.

The significant point is the company's 5c wage offer in the face of a 19c demand by IAM. Average 1956 wage settlements had been predicted as high as 10c, to match a booming economic period.

Steel will be the big test . . .

Big test will be in the steel industry in June, when basic steel bargains with the AFL-CIO Steel Workers Union. Signs of impending trouble are already showing up. The steel union flatly rejected an offer from International Nickel Co for a 5c an hour pay raise to USW members, to be put into a private saving kitty for each worker. It was expected that the steel companies might make such an offer, since this plan had been accepted in glass negotiations last year.

The steel union gave advance rejection notice to steel by advising that the savings plan is "entirely unacceptable" because the funds do not supplement jobless payments, nor make the employer responsible for layoffs. The union will demand a pooling of funds to protect all employees.

The bitter electrical industry strike at Westinghouse has already set a poor labor peace record for 1956. And the indications are that first guesses for good labor-management relations through the year will have to be revised if employers continue showing stronger resistance to demands than they did last year.

Standby controls . . .

Mobilization planners have put together a top-secret manual of detailed regulations to control production, materials, credit, the distribution of money, and the like, in case of emergency. Most of the standby orders are keyed to a Korea-type of war with no attack on the continental U S, but some do assume a nuclear attack here.

There's pressure to make the mobilizers declassify the manual, reveal details to the pubic. The argument is that the standby controls are valueless unless businessmen who would have to live with them know in advance exactly what to expect.

Washington is considering a softening of its security policy. But meantime, officials don't want to disclose details of the standby regulations.

Machine tool antitrust . . .

Three machine tool firms signed a consent decree late last month, ending a Sherman Act antitrust case charging a conspiracy to restrain and monopolize gearcutting-and-finishing machines and tools.

The charges were filed against Michigan Tool Co and National Broach & Machine Co, both of Detroit, and the Fellows Gear Shaper Co of Springfield, Vt., in April, 1953. Both civil and criminal charges were made by the government, the first major antitrust actions started under the Eisenhower Administration.

This brings to 81 the number of antitrust cases which have been settled out of court in the past three years by the Republicans, who have made this a major technique in their antitrust enforcement program. The principal advantage to companies is that by signing such decrees, they prevent use of a government antitrust victory against them by private parties in triple damage suits.

Under the tool consent decree, the companies agree to license all gear-finishing machine patents which they now own—or which they acquire in the next five years—for reasonable royalties, and to make technical specifications for commercial use of the patents also available to licensees. Similar arrangements for licensing certain gear-cutting machine patents to other manufacturers are contained in the consent decree.

In addition, the three companies are enjoined from fixing prices, allocating customers or sales areas among themselves, or exchanging patents with each other in any way that prevents making them available to other manufacturers.

The consent settlement does not dispose of the criminal charges, which are virtually identical to those made in the civil case and are still pending in Detroit Federal District Court.

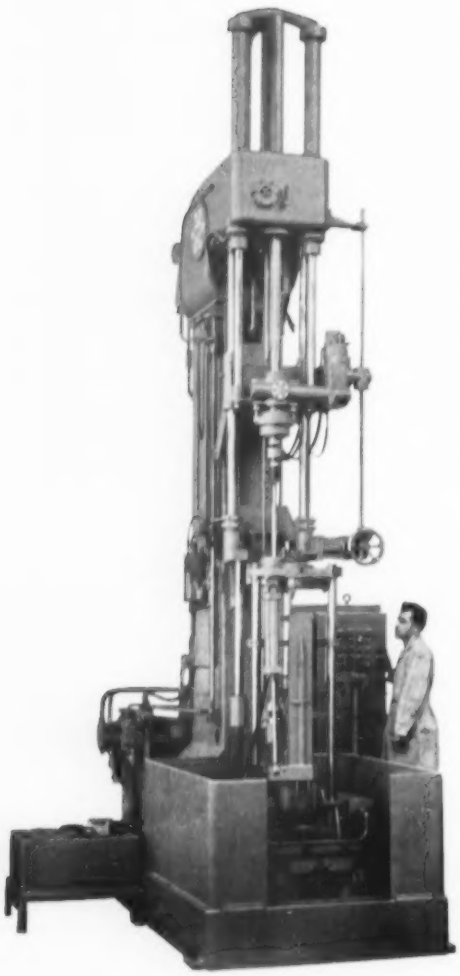
But settlement of the civil case is taken as a sign that the criminal case will be shortly closed, probably by payment of fines by the three companies.

Strike right upheld . . .

In a 6-3 ruling, the U S Supreme Court holds that workers may strike against an employer's unfair labor practices without waiting for the 60-day "cooling-off period" required by the Taft-Hartley Law where workers are striking to enforce economic demands. The court also ruled that no-strike clauses in typical collective bargaining contracts do not bar strikes protesting such unfair practices. Ruling upholds NLRB handling of dispute between Mastro Plastics Corp and French-American Reeds Manufacturing Co Inc, and the AFL Carpenters Union.

MICROHONING*...

Efficient Stock Removal
with
LOW-VELOCITY ABRADING



INCREASINGLY, process engineers are recognizing Microhoning's low-velocity abrading technique as a means of combining efficient stock removal with precision.

The Brooklyn Works of American Machine & Foundry Company, in the precision-manufacture of recoil mechanisms for artillery weapons, required a process that would most efficiently remove substantial amounts of stock and generate functional surface characteristics on the I.D. of recoil cylinders and O.D. of piston rods. After extensive study of available methods, AMF selected Microhoning as the most productive and economical process for obtaining desired results.

The floating piston in the recoil cylinder has nitrogen gas on one side and hydraulic oil on the other. Because silver ring seals are used, any error in geometry or roughness of cylinder or rod surfaces will induce deformation or scoring of silver rings and break these important seals.

The largest cylinder processed by AMF to date is for a 75 mm gun and has a bore diameter of 4.750 inches and a length of 46 inches. Piston rods for this gun are 1.375 inches in diameter and 56 inches long. Both I.D. and O.D. operations are on the same Microhoning machine—Model 450 Hydrohoner.

The Microhoning process efficiently removes up to .026 inch of stock from cylinders and .006 inch from rods to correct waviness, taper and out-of-roundness. A geometric tolerance of .0001 inch is held while obtaining a 1.5 microinch finish.

Working closely with AMF manufacturing personnel, Micromatic developed fixtures and tooling that minimize changeover time. The fixture for the cylinder is mounted on an indexing table so it is simply indexed away from the spindle while the rod is being Microhoned. You, too, can solve your precision stock-removal problems through application of Microhoning—the low-velocity abrading process.

For further information write for CROSS-HATCH, Vol. 7 No. 5

*MICROHONING =
Stock Removal + Geometry + Size Control + Surface Finish

MICROMATIC HONE CORPORATION

8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

Detroit . . .

Tooling outlook . . .

If you walk enough miles and talk to enough people, a pattern on spending for capital goods begins to form. In and around Detroit this is how the pattern looks for this year and on into 1958:

1956: The automobile industry is spending money in 1956—a lot of money . . . might even hit that big figure of $1 billion.

General Motors has earmarked a billion for spending; $750 million from last year and $250 million out of this year's money. Much of the $750 million will be spent in the plants in Marion and Mansfield: GM people say that about $300 millions will be spent on tooling and machinery in the two plants. Out of the current year's $250 million (which is part of the $1 billion, remember) about $50 million has been allocated for tooling.

Ford doesn't talk much about spending — but the figure that is slipped from the side of the mouth out around Dearborn is $300 millions.

Chrysler says maybe $200 millions, maybe more than that. Studebaker-Packard is insisting it will re-tool for next year's models (and they'll be new) at no more than $150 million tops. American Motors will bring up the rear with less than $40 millions for tooling.

Summation for 1956: as good as 1955 — maybe even better.

1957: Spending for tooling and machinery will drop. General Motors will be face-lifting the B & C shells. Ford will be doing a major job on the Lincoln and a face-lift on the other lines.

Bright spot in the Ford picture for 1957 (and late 1956) is the proposed introduction of two new lines. At the moment they are unnamed.

Both cars will look alike, will have same name — but will vary in size. The smaller one is to compete with Pontiac, pricewise. The larger one with Buick/Olds. They will be introduced — so far as plans are known now — in mid-1957 as 1958 models.

Ford people say they will "depart radically in body styling" . . . which means, at the moment . . . no rear fins and no hooded headlights

AMC will be doing a revise, completely, of the Rambler for 1958—Nash and Hudson will only be facelifted. Chrysler can only be expected to be face-lifted but Chrysler will be spending money in new plants for tooling and machinery that it is not spending now (rumor has it in Detroit that Chrysler will build still another plant in the East for Plymouth assembly, possibly running in some Dodge assembly in the same plant). Studebaker-Packard will not be doing a major job in 1957.

Summation for 1957: not as good as 1955 or 1956—but a very good year.

1958: Mention 1958 and the faces begin to glow. The word for 1958 is B-I-G!

Most styling people — and some engineers — think that by the time 1958 rolls around a definite change in auto styling will be well underway and reflected heavily in tooling and machinery expenditures by the industry.

Part of this optimism could be due to a predicted big swing to fuel injection; part could be to the solid belief held by many engineers that 1958 will see a few trucks on the highways with gas-turbine engines. This would mean tooling for auto gas turbines would be well underway.

Bolstering the comfortable feeling about 1958 is this fact that tooling people point out: a tremendous market for replacement and new development in tools exists now and will get greater in the next two or three years — some say it will be very active for the next 10 years.

The crystal ball is a never-never land — but the wise heads in the automotive industry aren't a bit afraid to look into it.

Alarm over increased gas taxes . . .

Prime concern at the moment is the proposed federal plan to add a cent-a-gallon to gasoline prices. The rising cost of gasoline is beginning to bring in to showrooms an almost-forgotten question. "What kinda mileage does she get."

When the current trend to bigger cars and snorting, roaring, gasoline-eating acceleration performance runs headlong into a stubborn demand from the guy who buys for "more mileage per gallon," there is going to be a scramble to satisfy that man—because more than in any other business, the man who buys is the king along Auto Row.

The only manufacturer that is sitting back with no worries on the score of gas economy is a supersalesman named George Romney of American Motors, who is chuckling contentedly into his Rambler's gas gage.

Transmission change . . .

The Chrysler Imperial is getting a new three-speeds-forward automatic transmission to replace the two-speed unit. This will make the Imperial highly competitive with Lincoln and Cadillac in the performance field. Word is out that all of the 1957 Chrysler line—from the Plymouth Plaza to "the exclusive Imperial"—may have this new automatic transmission.

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MILL-M-MATIC for Accurate, Heavy Duty Production Milling . . . .

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All machine functions within easy reach. All-electric, automatic controls built to conform with J. I. C. standards.

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25 Hp. Anti-Friction Spindle Drive

Heavy duty milling head driven by large bull gear through involute spline. Extra wide bearing surface in housing when quill is fully extended.

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All the features of Mill-M-Matic point up to high, accurate production. A fresh approach employing control by electric-mechanical powered action opens new possibilities in long life and precision operation in the field of *production milling*. Our 10-page bulletin describes all the advantages found in Mill-M-Matic.

The
MOTCH & MERRYWEATHER
Machinery Co.

MACHINERY MANUFACTURING DIVISION

CLEVELAND 13, OHIO

Machine Tools . . .

January was third best peacetime month . . .

New orders for machine tools in January were $118 million. That represents a drop of almost $39 million from December and of $10 million from November.

But it is more than $15 million above October. Just to keep the January performance in proper perspective, one should point out that bookings in that month were at an annual rate of $1.4 billion.

And the figure was attained without benefit of the large defense business placed in December by the Air Force.

January orders were almost entirely of civilian origin.

Incoming business of the metal-cutting machine tool industry set an astounding record for peacetime in the four-month period from October 1 to January 31. New orders totaled over half a billion dollars.

Never before, except in war days, did anything like this ever happen.

Volume of orders likely to drop off . . .

From here on, a large volume of orders is expected to be booked by builders. But it would not be surprising if the monthly dollar total slid off somewhat.

Shipments of machine tools in January were $56.7 million, down almost $14 million from December.

There is no quick and sure explanation for this drop in the face of mounting backlogs.

Probably the best reason is that effects of the prolonged Westinghouse strike are now being felt. Westinghouse's inventory of motors, electrical controls and other items going into machine tools has about been exhausted.

Machines waiting for electric parts . . .

Many machine tools are sitting on builders' floors waiting for necessary electrical parts.

One other reason, which is not believed to be the major one, is the easing of the big push that builders traditionally put on in December to clear machines from their assembly floors before the year-end.

Deliveries meanwhile have lengthened further. The industry today has a backlog, on the average, of 7½ months. At the beginning of 1955, it was less than 4 months.

One point to keep in mind: Machine tools are much more complicated and intricate to build than they used to be. And many more of them are specials or at least have special tooling. These developments contribute to a longer manufacturing cycle.

The January production rate is not believed to be indicative of what to expect as the year rolls on.

Output of machine tools has been retarded by the task of getting brand-new models into production.

The task is not yet completed, but the number of machines turned out will pick up substantially.

Olympia Show Set for late June . . .

The International Machine Tool Exhibition will be staged at Olympia in London from June 22 to July 6 by the Machine Tool Trades Association of Great Britain, using 252,000 sq ft of stand space.

American builders will participate, as will builders from all western European countries as well as from Great Britain. As usual, all non-British machines will be shown on the stands of British sales agents.

Some 23,000 copies of the pre-Exhibition catalog, index in English and French, have been mailed.

The Olympia Show, operating on a four-year cycle, will have on display machine tools, small tools, gages, presses, hammers, heat-treating units, etc.

Crosby appointed to BDSA post . . .

Joseph P Crosby, vice president in charge of sales LaPointe Machine Tool Co, has become director of the Metalworking Equipment Division of the Business and Defense Services Administration, Department of Commerce. See p250 for details.

STILL THE THIRD BEST PEACETIME MONTH, despite a cutback in new orders for machine tools of nearly $39 million from December, January recorded 399.2 for new orders on the National Machine Tool Builders' Association Index, and 191.9 index for machine tool shipments

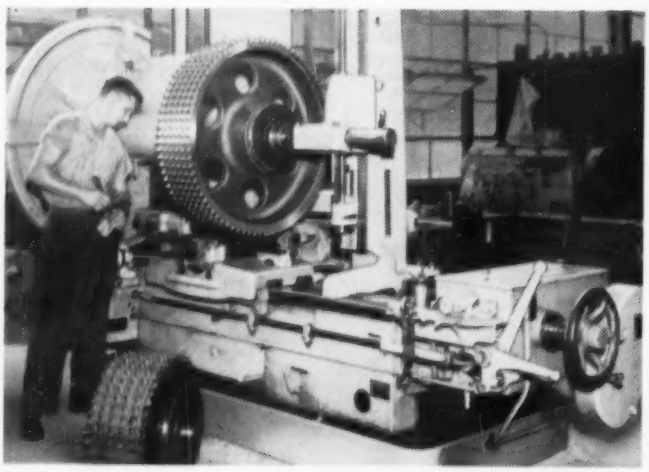
in case you missed the News!

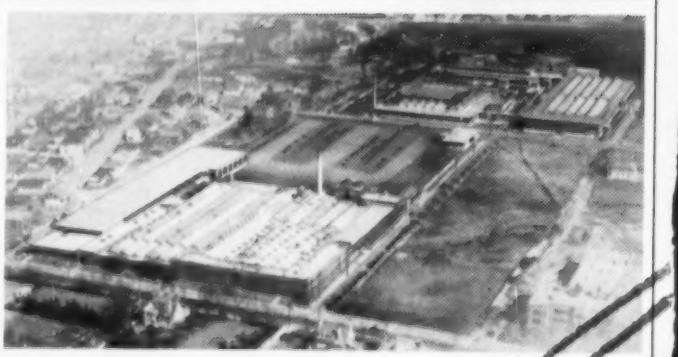
Newark Gear Cutters and Hobbers

are now manufactured by POTTER & JOHNSTON COMPANY at the P&J plant, Pawtucket, Rhode Island

TO AVOID DELAYS AND TO INSURE PROMPT ATTENTION AND HANDLING, PLEASE ADDRESS ALL INQUIRIES AND ORDERS DIRECT TO POTTER & JOHNSTON AT PAWTUCKET.

As previously announced, assets of the Newark Gear Company have been acquired by Potter and Johnston Company, subsidiary of Pratt & Whitney Company, Incorporated. In addition to the complete line of P&J Automatic Chucking Turret Lathes, these long-famous automatic gear machines are now being manufactured in our Pawtucket, Rhode Island plant. Product literature, including complete specifications and engineering data, is available. Write on your Company letterhead outlining your requirements.





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AUTOMATIC CHUCKING TURRET LATHES

P&J CUTTERS NEWARK GEAR HOBBERS

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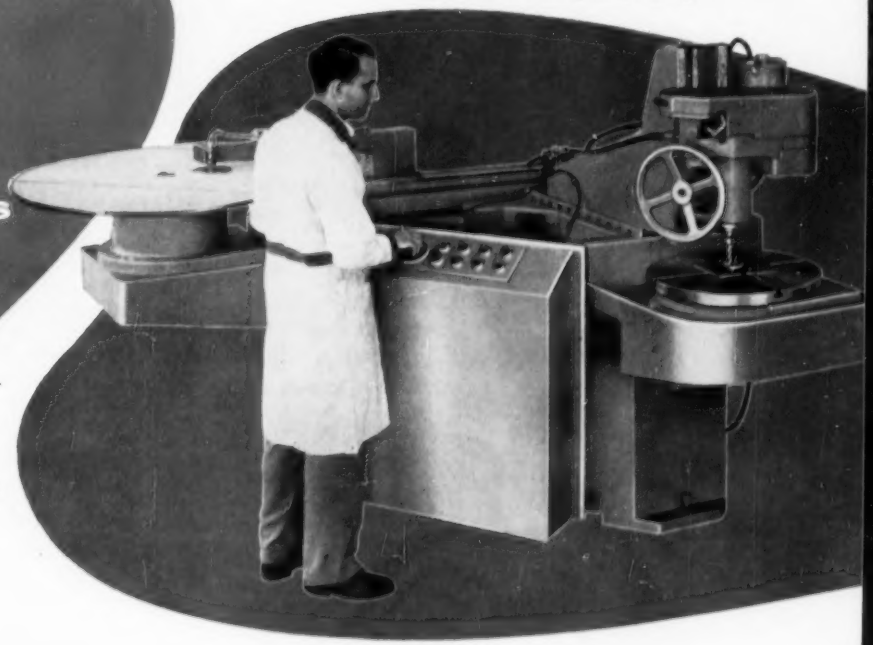
Here, the non-contacting tracer follows the large-scale contour drawing easily prepared with electrically conductive "ink." For this job, a 10:1 drawing-to-workpiece reduction ratio is used, but any desired scale such as 20:1 or higher can be selected.

Following the action of the tracer, the cutter reproduces the exact shape of the drawing on the workpiece. Due to the selected reduction ratio, any errors in the drawing are reduced in the same proportion; resulting in accurate milling or grinding.

mill or grind IRREGULAR CONTOURS *without* expensive models *or* complex special tooling



- mill or grind directly from simple line drawings
- extremely accurate
- unique, non-contacting tracer control

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If you are producing external or internal cams, templates, blanking punches or dies of complex, irregular shape, here are important opportunities for greater accuracy, shorter production times and lower costs than ever before possible! Send for your copy of Circular No. 579-1 fully describing the Model 104 Cam and Template Machine. Or, write to West Hartford on your Company letterhead outlining your requirements. Manufactured by the New England Machine & Tool Company. Sales representation by Pratt & Whitney.

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FACTS

about

NEW DEPARTURE
BALL BEARINGS

Self-sealed bearings simplify design . . . cut maintenance costs

New Departure originated self-sealed ball bearings to eliminate the most common causes of bearing wear and failure—such as abrasive dirt and improper lubrication. Since then, more than 300,000,000 New Departure sealed bearings have been produced in various types to fit the specific requirements of industry. Seals are available to keep out foreign matter, ranging from dust and dirt to corrosive gases . . . to retain lubricants, varying from heavy grease to light oil . . . to provide the protection that assures longest life.

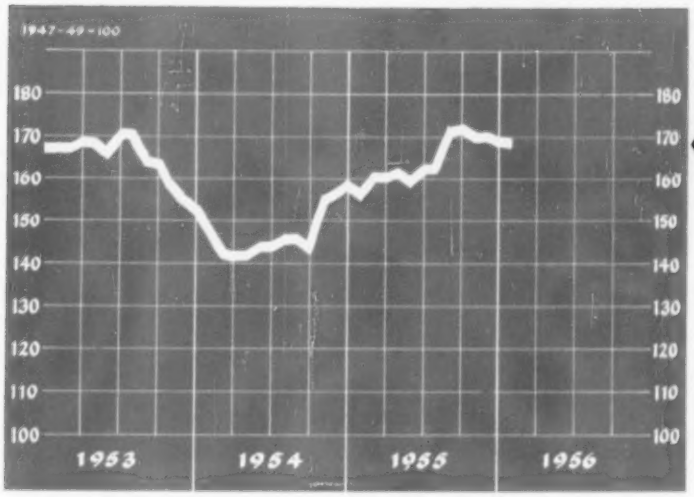
New Departure's latest advance, Sentri-Seal, embodies exclusive features which importantly improve both bearing performance and range of application. Because of its design, Sentri-Seal provides controlled, highly efficient sealing with low torque and is not materially influenced by axial movement due to bearing end play within prescribed tolerances.

Sealed ball bearings offer the electric motor and machine tool builder many advantages. They simplify design, make it possible to mount motors in any position, cut maintenance to a minimum, and eliminate the need for relubrication for long periods of operation.

WRITE FOR COMPLETE INFORMATION ON NEW DEPARTURE SEALED BEARINGS!

NEW DEPARTURE • DIVISION OF GENERAL MOTORS CORPORATION • BRISTOL, CONN.

Gaging Metalworking . . .



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	FEB Esti-mated	JAN Pre-liminary	DEC Re-vised	JAN Year Ago
Total index	**168**	**169**	**170**	**156**
Machinery	**142**	**143**	**120**	
Electrical Machinery	**196**	**198**	**192**	
Autos	**161**	**176**	**143**	
Other Transportation	**288**	**275**	**286**	
Other Metalworking	**143**	**143**	**129**	

Capital goods demand strong . . .

Manufacture of capital goods is so strong that it is doing yeoman service in keeping metalworking production close to the 1955 peak volume.

Makers of all kinds of industrial and electrical machinery are doing all right.

They have large backlogs which have been added to in recent months. Their output, in many cases, is expanding rather than contracting.

From the standpoint of production alone, they will turn in a most impressive record for 1956.

The machine tool industry, as well as practically all other makers of production equipment, is going into a period of expanded output.

Cutting tool business brisk . . .

The cutting tool people, whose business is a pretty good gage of metalworking operations, are optimistic about the outlook. Some companies in this field are estimating first-half sales to be at least 10% higher than in the comparable period a year ago.

Manufacturers of materials-handling equipment are expecting a 10% gain in 1956 over record-breaking 1955 bookings. The forecast is based on anticipated industrial expansion, increased production being planned with existing facilities and the incipient labor shortage.

Industrial customers provided materials-handling builders with 35% more business in 1955 than they did in 1954.

Freight car building is expanding . . .

Railroad freight car companies, loaded with orders, are stepping up work, but their lead-time is so long that it still will be several months before they get going to full capacity. Backlogs stretch out over the next two years.

In the domestic plumbing field, manufacturers predict that this year will be better than last.

Number of houses to be built will be fewer than in 1955, but the quality will be better and the houses will be bigger.

Construction of institutional and office buildings is on the rise, too.

Automotive slump being felt . . .

Chief weakness in Metalworking just now is the automotive slump. Curtailment in production the past few weeks has been the most drastic in a long time. Dealers around the country still are burdened with excessive inventories.

Detroit's sagging operations are being felt in the sharp downward course of releases of steel and other materials and of car parts.

Steel mill operators continue to feel no pain. To be sure, Detroit's demand for steel is off a lot from what it was. But other users want steel badly and their orders offset the lessened tonnage to car makers.

Steel still flourishing . . .

A quick rundown of some steel items shows that: Many pipe mills, especially those making larger sizes, are booked solid for the year. Plate is getting tighter week by week. Structurals are sold out as far ahead as mills care to take bookings.

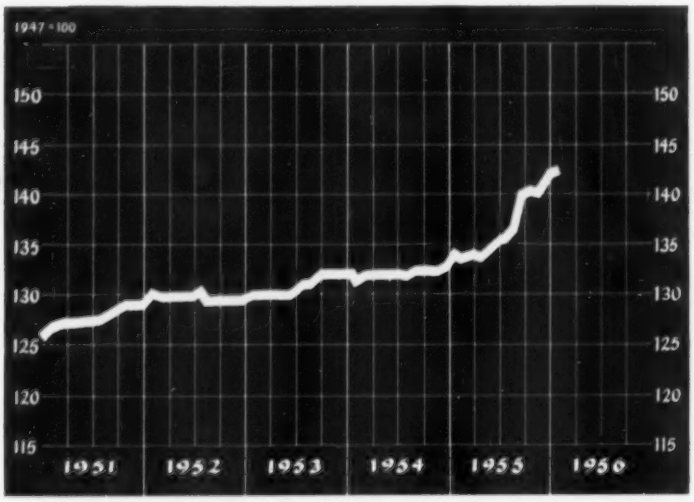
Even flat-rolled light-gage sheet and strip are doing very well despite reduced shipments to Detroit.

Gray iron foundries are feeling the beneficial effect of the growing production of capital goods.

Gaging Business . . .

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	FEB Estimated	JAN Preliminary	DEC Revised	JAN Year Ago
Total Index	**142.3**	**142.1**	**140.9**	**133.9**
Metalworking Machinery		158.6	158.1	143.9
Other Machinery exc. Electrical		147.8	147.4	137.6
Electrical Machinery		137.0	136.8	132.0
Fabricated Metal Products		136.0	135.9	130.7



Gentle dip on a high plateau . . .

U S industrial production, which began a very gentle decline at 1955's end, continued through February —but it's still running nearly 10% ahead of the comparable period in 1955. Durable goods output declined in January, dipped again in February. Much of the drop-off can be attributed to lessening automotive output.

The overall economic picture . . .

Recent indications suggest the U S Gross National Product has not yet reached the $400 billion-a-year mark.

While consumer spending on durable goods may be a little off, appliances are selling very well—and so are automobiles, despite persistent talk to the contrary. Residential construction has dropped off from its unprecedented peaks, but it's still at a very high level.

Business investment in industrial and commercial construction and in producers' durable goods is on the rise. So is consumer spending on non-durable goods and services.

On balance, GNP in the first quarter of this year may be about the same, or slightly higher, than fourth quarter 1955's $397 billion rate.

Job picture is spotty . . .

Although January chalked up an all-January record for non-farm employment (49.5 million at work), manufacturing jobs dropped off more than usual for the beginning of the year—principally in the automotive, lumber, fabricated metals and non-durable goods industries. Declines in trade and construction, however, were smaller than usual.

Average factory workweek was off seven-tenths of an hour in January for an average workweek of 40.6 hours, compared with December's 41.3 hours. But January's workweek was four-tenths of an hour higher than in January 1955, and slightly above the postwar January average.

Unemployment increased about 460,000 between December and January. People without jobs, but actually looking for work, totaled 2.9 million. It's surprising to note that there were 800,000 fewer in the labor force in January 1956 than there were in January 1955.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-49 = 100)*	150.3	151.4	139.0
Steel ingot production (thousand tons)	2,422	2,433	2,218
Electric power output (million Kilowatt hours)	11,277	11,321	9,912
Production of automobiles and trucks	155,106	158,903	195,079
Engineering construction awards (Eng. News-Record, millions)	$355.8	$440.1	$373.2

MONTHLY BUSINESS INDICATORS

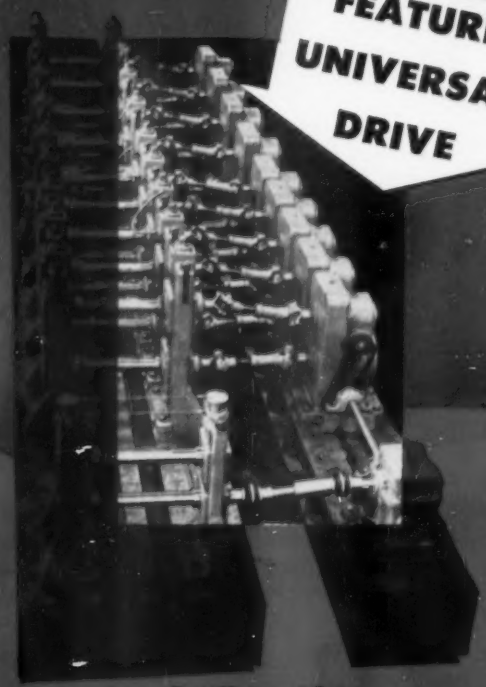
	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	313	235	229
Vacuum cleaners sales (thousands of units)	243	308	217
Washers sales (thousands of units)	357	361	265
Household electric ranges sales (thousands of units)	118	88	85
Radio production (thousands of units)	1,786	1,581	1,262
Television production (thousands of units)	605	632	833
Gear sales index (1947-49 = 100)	245.5	210.4	182.2
Foundry equipment new orders index (shipments, 1947-49 = 100)	183.9	154.4	113.9

* Seasonally adjusted

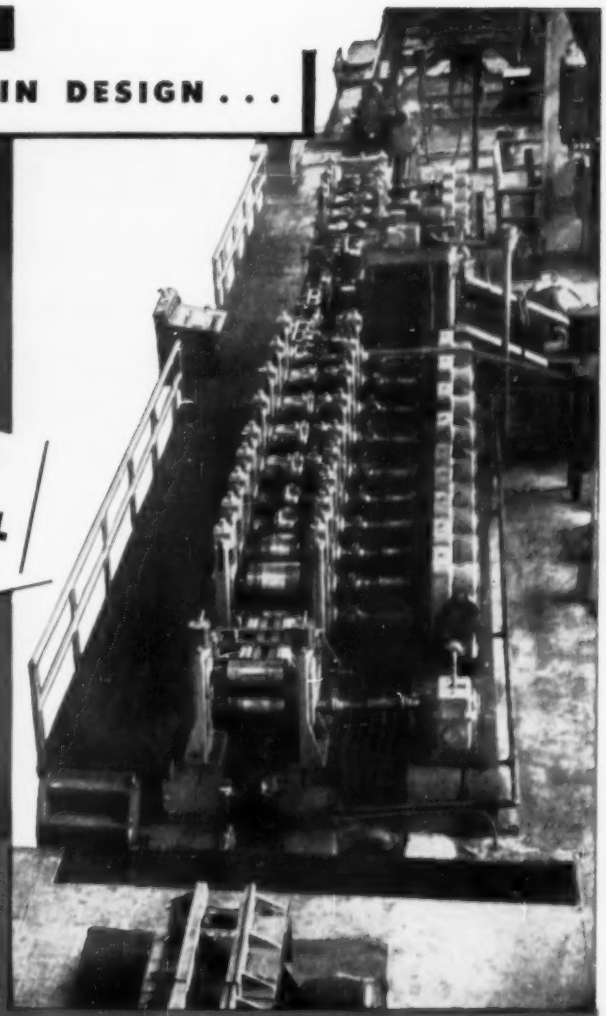
LEADING THE INDUSTRY IN DESIGN . . .

Etna TUBE MILLS

FEATURE UNIVERSAL DRIVE



Etna Universal Drive



You'll notice a trend toward Etna's modern machine design. Etna has sold more Universal Drive Mills than all other manufacturers combined. The Universal Drive provides greater accuracy in the forming of the tube, and allows an easier change from the manufacture of one diameter tube to another.

PERMANENT OIL COOLED TRANSFORMER

For greater efficiency an *Oil Cooled Transformer* is incorporated into the machine. It is a *permanent unit* and *never has to be replaced*. Cooling with oil eliminates the necessity to dry out the transformer after each days work, which is necessary when water is used as a transformer coolant. Etna Mills . . . Built for continuous operation. Write for complete details.

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"One of the best money-making tools in our shop"

Forming cylindrical sections 8' 0" long, 5' 0" diameter from ⅜" steel plate.

With a Steelweld Press in your shop, you can handle almost any kind of a metal-forming job put up to you. Large heavy cylinders for buckets, drums, boilers, etc., are easily formed with standard bending dies.

You will find Steelweld Presses extremely versatile machines. With various jigs, dies and tools available, and others that can be developed for special purposes, a wide range of work can be performed on steel, aluminum, and the many alloy metals.

The opinions of many owners can be summed up in this statement of one: "A mistake that we didn't buy it years ago. One of the best money-making tools in our shop."

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CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Want New Tooling Ideas?

Tooling for production is a much bigger and more expensive job today than it ever has been.

It is easy to understand why this is so. There are many more materials from which to choose than there used to be. Some are tailored for special situations. Others are so new that not enough is yet known about their work characteristics.

Closer tolerances are the order of the day in metalworking manufacture. Production to the fineness of the seventh decimal place is with us. And it is no trick to predict that even more minute limits are on the way.

Production machines are larger, more powerful, more automatic, more complicated and perform more operations (and do them faster) than ever before. They go through their cycles with little if any physical help from humans.

The skill formerly provided by the operator is now being built into the machine. The task formerly done by the operator of putting the work into and taking it out of the machine, and of moving it to the next machine, is being done automatically.

Then, like it or not, there is automation and its various involvements. Automation, as it rapidly builds up into a science, is being used more and more to speed production and to lower costs. The Russians are so impressed by its potentiality that they have established a Ministry of Automation.

Altogether, tooling for a new product or for a new plant or for production of a redesigned product is a bigger job than it was five or ten years ago, not to mention its simplicity in prewar days compared with now.

More billions are being spent this year than at any previous time in history for new plant and equipment. The outlay in Metalworking will surpass 1955's fancy figure. **This fact means that a colossal tooling task is now in progress.**

In this spectacular kind of setting, the American Society of Tool Engineers will stage its biennial Tool Show this month — March 19 to 23 in Chicago at the Amphitheatre.

Metalworking production executives as well as tool engineers will want to visit this show to see for themselves the latest developments in tooling techniques. The brand-new products to be on display at the show are described in this issue of *American Machinist*.

New ideas in tooling are being created faster than ever these days. Some of them stem from the large amount of research and development work that is being done. Others come into being from the urgency to achieve manufacturing economies and to increase quality.

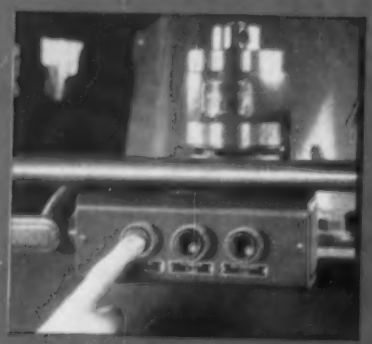
Whatever the reasons for the dizzy pace at which new tooling ideas are being introduced, the fact is that you cannot afford to ignore them. You can bet that your competitor won't. Examine them wherever they are on display. The Tool Show this month is a good time and place to do it.

Burnham Finney

EDITOR

Test cuts eliminated

by accurate performance of CINCINNATI Shears...



The Buttons that save time. The great time-saver—the Cincinnati front controlled Power Back Gauge.

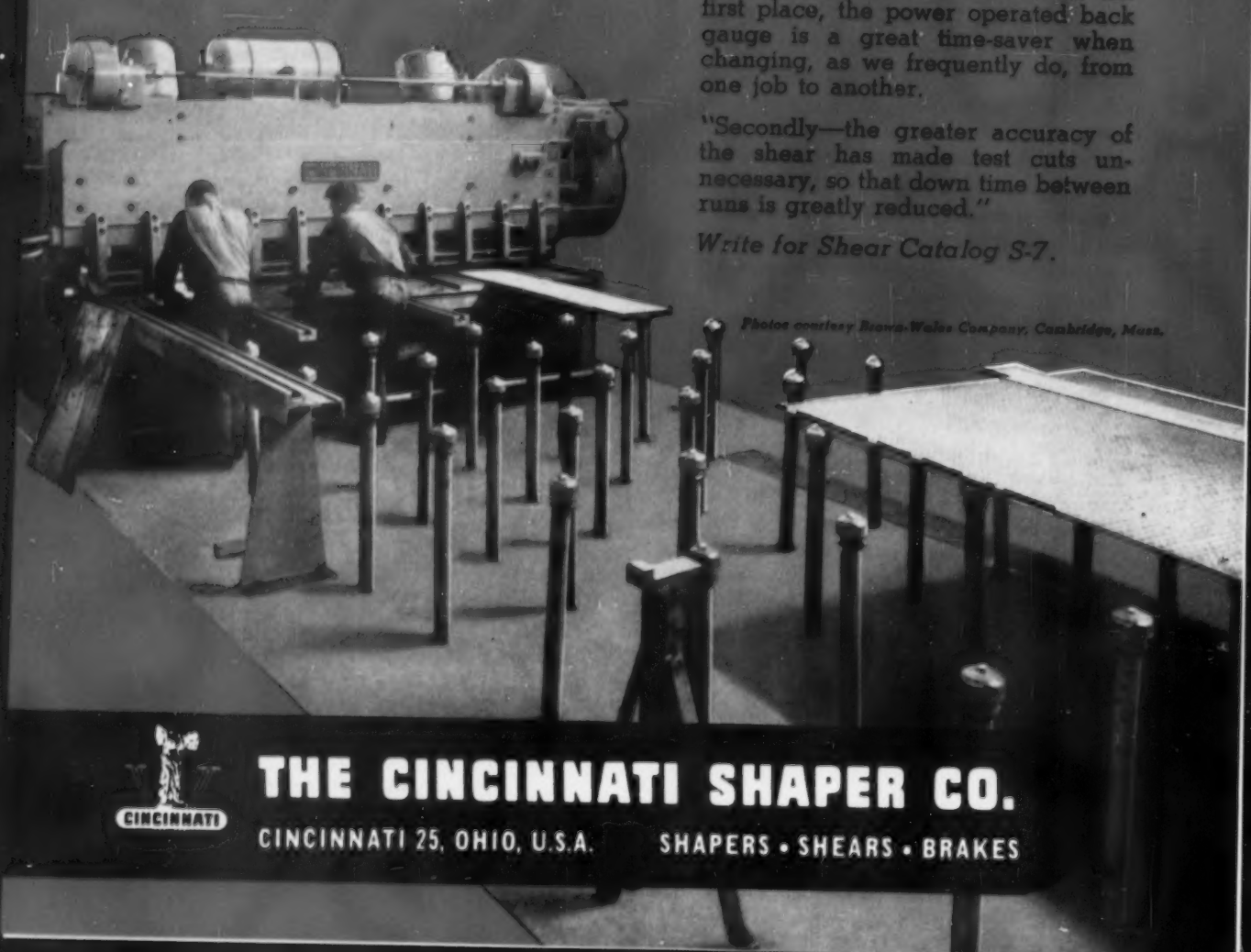
Brown-Wales Company says:

"As a steel warehouse, we have comparatively few production jobs, however, we have found that our men with this new shear can turn out far more work in an hour or a day than they could with the old one. In the first place, the power operated back gauge is a great time-saver when changing, as we frequently do, from one job to another.

"Secondly—the greater accuracy of the shear has made test cuts unnecessary, so that down time between runs is greatly reduced."

Write for Shear Catalog S-7.

Photos courtesy Brown-Wales Company, Cambridge, Mass.



CINCINNATI

THE CINCINNATI SHAPER CO.

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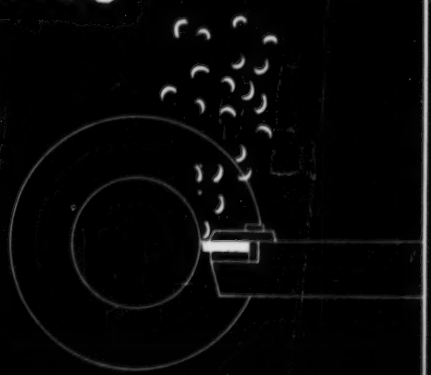
American Machinist
SPECIAL REPORT NUMBER 417

Tomorrow's Cutting Tools



Where do they stand today?

Ceramics (such as the oxides), nitrides, borides and silicides — are these to be our toolbits to cut the new and harder materials as well as heat-treated steels? Oxides already have been used at speeds four or five times those of carbides. Finishes are equal to some ground ones, and no cutting fluids are required to save the tool. Why is it that these brittle, fragile bits — that most of us hadn't heard of until the Machine Tool Show last fall — are so suddenly so important?

In the following six pages we sum up what is known about these "new" materials at this time, starting back before the development at the Watertown (Mass) Arsenal's Rodman Laboratory, first reported in *American Machinist* in February, 1955. In the succeeding 13 pages we present a detailed analysis of the new materials compared with carbides and high-speed steel, based on laboratory and shop tests. Ceramics cutting cast iron at Skoda Works are described in two more pages. This Special Report, most of which consists of brand-new information, is designed to help you evaluate for yourself what the new ceramic tools will mean to you in your shop.

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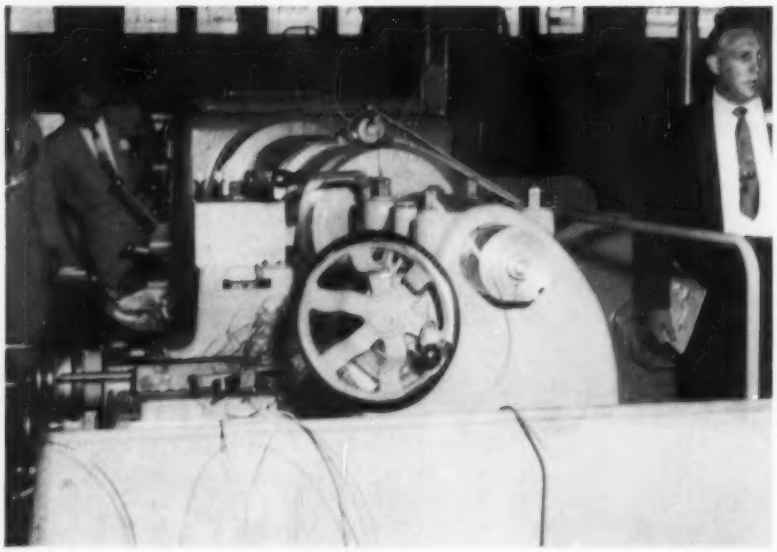
Tomorrow's Cutting Tools



Spectacular . . .

. . . high-speed runs with cemented-oxide tools at the Machine Tool Show last fall were made without a chip-breaker, so the chip flew some 10 ft through the air to the totebox (foreground) at the tailpost. This is the 125-hp LeBlond test lathe which also made the runs pictured on our cover

what we should know about

A year and a half ago, you hadn't heard of ceramic tools, but they were the sensation of the Machine Tool Show last fall. Here's a roundup combining essential data from previous articles and much new information. It covers both the already-announced oxides and the borides, lists characteristics, gives some typical test runs

When the chips flew 10 feet across the floor at the Machine Tool Show, and hard materials yielded to the toolbit at up to 2000 sfpm, the word got around about fabulous new tool materials—ceramics. "Looks like a tile from the bathroom floor, but it can cut steel ten times as fast as carbide and doesn't get hot!" . . . "Brittle as glass, but if you can hold it, it will give five times the tool life." . . . "Just out of the lab and won't be ready for a year."

These statements contained a lot of truth, but not the whole truth. Ceramics are spectacular and do have tremendous potential, properly used. Some are already available, and claims and counterclaims are already being made. So that *American Machinist* readers will have the whole truth, we are putting available data, in condensed form, into this article.

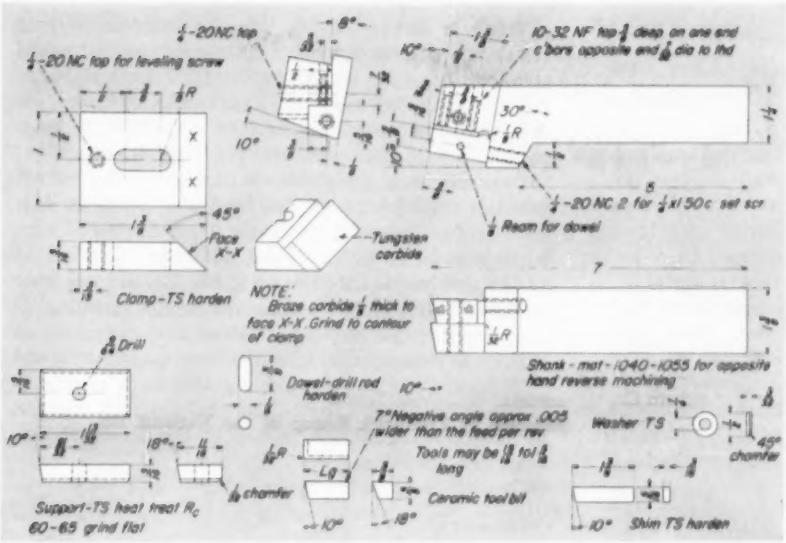
Why new tool materials?

Two completely unconnected factors have worked together to create the need for different tool materials, one military, one civilian. Wartime and defense shortages—or fear of shortages—in tungsten and cobalt created consternation in many circles. Without these two critical materials, tungsten carbide is impossible, and World War II made us very definitely a carbide-tooled nation.

The other factor sparking the search—this one largely postwar—was our development of harder and tougher materials of manufacture and the rather daring decision to try to cut—with turning and milling tools—hardened and sintered pieces. The latter was a smart way to get around heat-treating distortion, and a smart way to cut grinding costs—if it could be made to work. Research men explained that the reason our metal tools crumbled or burned was because the harder and/or more-abrasive materials to be cut raised tip temperature too high. With cemented carbide tools, failure of the bond occurred. When we poured on cutting fluids to keep tip temperature down, the result was an alternating heating and quenching that caused tool failure from cracking and spalling.

The atomic, guided-missile and jet programs introduced one "unmachinable" material after another —stainless 347, Nimonic, J-metal, Vitallium are some of them—then demanded tolerances that precision casting, sintering, and forming could not achieve without the "impossible" final machining. Then came titanium with its itch to combine chemically with the cutting tool, uranium and its pleasant habit of catching fire at the least excuse (that's what "pyrophoric" means—a nice scientific word to mask a critical fabrication characteristic).

These dangers and problems sparked a search for non-critical and harder alternatives for carbides. Oxides and borides are quite logical ones, both from the scientist's and the shopman's point of view. For while search of the periodic tables and the hard compounds will bring the scientist to this conclusion,


1/4-20NC tap
1/4-20 NC tap for leveling screw
10-32 NF tap 1/4 deep on one end c'bore opposite end 1/4 dia to thd
30°
10°
45°
Face X-X
Tungsten carbide
1/4 Ream for dowel
1/4-20 NC 2 for 1/4 x 1 50c set scr
Clamp-TS harden
NOTE:
Braze carbide 1/8 thick to face X-X. Grind to contour of clamp
Shank - mat - 1040-1055 for opposite hand reverse machining
Drill
Dowel-drill rod harden
7° Negative angle approx .005 wider than the feed per rev
Tools may be 1/8 tol 1/8 long
Ceramic tool bit
Washer TS
45° chamfer
1/8 chamfer
Support-TS heat treat Rc 60-65 grind flat
Shim TS harden

Toolholder . . .

. . . ultimately designed for Rodman Laboratory tests shows necessary elements to utilize ceramic hardness, high-temperature strength and wear resistance, yet protecting the bit against thermal shock and low-temperature tensile stress. Heavy shank increases rigidity, a broad clamp and base support avoids stress concentration on the bit, and a mechanical chipbreaker of carbide is adjustable to control the chip. The tool is used with minimum overhang

Courtesy Norton Company

CERAMIC TOOLS

E J TANGERMAN, Executive Editor

the shopman has for years used iron oxide as a fine polishing material, has cussed silica on casting because it "polished off" his tools, and used bits of china and broken grinding wheels or honing sticks to dress fine grinding wheels.

We also knew that boron carbide, which had been available since before the war, was harder (until the synthetic diamonds of a year ago) than any other man-made material, but was too brittle for many services. It had a lot of desirable characteristics, though, in addition to its hardness: it was stable (no growth or creep), chemically inert, absorbed heat slowly, and didn't tend to "mush" or break down at elevated temperatures—in fact had to be heated to 4440 F before it would melt. (This contrasts with an upper limit of about 1450 F before cemented tungsten carbide begins to soften, and 1800 F when it lets go.)

One factor which was not important in original experiments, but which is looming larger each passing day, is that of tool life in automated setups. Even carbides do not do too well under such conditions, and the cost of downtime for tool change is high.

History of ceramics

There have been experiments with ceramic tools for 15 years or more, but first rumors of success came to *AM* from overseas. English experiments during WW II were carried on afterward, were very successful in cutting abrasive plastics. At least two years ago, a British company (BSA Tools Ltd) announced ceramic toolbits, but eventually abandoned them. We published the original announcement in "Spot News," but could get no further data worth publishing, although we heard some bits had even been tested in the US. The verdict was unanimous. "No good for steel—yet."

But there were also rumors from Russia. We succeeded in getting a digest translation of several articles, published in over a year ago, (*AM*—Nov 22, '54, p113-115). This indicated the Russians have at least seven different ceramic bits, best grade being TsV-332 (Mikrolit). These materials have specific gravity of 3.85 to 3.95, hardness to R_A90, heat resistance to 3500 F (this seems very high—Ed), bend strength up to 56,000 psi, compressive strength up to 420,000 psi. Ceramic bits were used in Russia in single instances prior to WW II, but have been under intensive development since 1947. Soviet papers about these materials were published in 1952 and thereafter, but the first paper appears to have been German, by Dr Ostenberg in *Machinenbau Betrieb* (1938, No 5/6).

(Actually, ceramic bits had been under development for a long time in the US too, but not for cutting steel. First work was as early as 1935, in at least two labs, and bits were used for machining graphite and "green" ceramics.)

Then, in February, '55, we at *American Machinist* received a telephone report that Rodman Laboratory, at Watertown Arsenal, near Boston, had run successful tests with ceramic toolbits. We requested a copy of the report from the Rodman Laboratory, published essential details in a single-page news article in our next issue (*AM*—Feb 28, '55, p153). Here were real results—on steel—and the race was on. The editor who wrote the story happened to mention the story several weeks later to engineers at GE-Evendale (Ohio), found that they'd seen it just the day before, and that they had immediately

Tomorrow's Cutting Tools

...what we should know about CERAMIC TOOLS

called Watertown and flown their top tool engineer east the next day.

Our preliminary research before the Machine Tool Show disclosed "nothing new" on ceramic tools, but at the Show itself two makers showed them and at least five lathe makers ran spectacular tests.

Since the Show, at least six US companies have been extremely busy in development. Four have announced availability of commercial bits (Norton Co, *AM*—Oct 24 '55, p180; Carboloy Dept, GE, *AM*—Nov 21 '55, p182; Stupakoff Div, Carborundum Co, *AM*—Dec 19 '55, p154; Diamonite Div, U S Ceramic Tile Co, *AM*—Jan 30 '56, p133). We have had development reports from two more.

On boride tools, Navy-sponsored research was done two years ago by American Electro Metal Corp, Yonkers, NY (see *AM*—Apr 13 '53, p150), and private research by Rand Development Corp, Cleveland. Neither has thus far resulted in a commercial bit, although results are favorable (see later). The American Society of Tool Engineers is currently sponsoring research on them at Armour Research Foundation, but this has barely gotten under way.

Oxide

Aluminum oxide (Al_2O_3) is sapphire—and the major ingredient of most oxide bits thus far announced, running 89 to 99% of the mix. The rest may be silicon oxide, magnesium oxide, or other oxides not yet revealed (possibly chrome and nickel), and binder materials. The mix is processed like most powder metals, and usually sintered at high temperature—3200 F and higher. The product is a bit with hardness of 90 to 95 R_A, compressive strength of 500,000 psi, transverse rupture strength of 40,000 to 85,000 psi, but brittle. In demonstrations at Chicago, all bits were held in clamp-type holders, with tungsten-carbide support blocks under the bits to prevent flexing and Brinelling, either of which will break the bit. Four of five tools also had WC chip-breakers positioned so the chips could not impinge on the bit. (In the fifth case, the breaker block was left off to show the high speed at which the chip is produced.) Failures were a result of breakdown of the nose radius or abrupt sloughing off of an area—there was no evidence of the familiar nose wear that causes "fuzz" on the turned surface.

In general, the bits are not recommended for machining the hard "skin" from a casting, nor for scaling the top layer from a rolled or forged steel part, although some have been so used successfully. Also, the cut should not have sudden changes in cross-section or interruptions. Rough edges at cut ends should be chamfered with a conventional bit, or the ceramic should be combined with a carbide leader tip for the purpose.

Work is already being done to improve impact resistance of ceramic bits. One direction is toward stronger bonding materials, another toward redesigned tools. For example, high lead angle, and resulting thinner chip, of such bits will enable heavier cuts, and may overcome the tendency to smash.

Ceramics are decidedly harder than the more-familiar carbides or borides thus far. Common ratings on the Rockwell "A" scale place cemented carbides around 90 to 92, oxides up to 94 (Russian up to 90) and borides around 88 to 90. The Knoop scale is more reliable for brittle materials (because it doesn't chip the samples). Here are comparative ratings of some typical hard materials, as determined at Norton Company, employing standardized measurement conditions based on the original method proposed by Frederick Knoop of the National Bureau of Standards: *

Material	Knoop Hardness K_{100}
Hardened tool steel, R_c 60.5	740
Quartz, SiO_2	820
Garnet, $Al_2O_3 \cdot 3FeO \cdot 3SiO_2$	1360
Cemented tungsten-carbide tool materials	1400 to 1800
Primary (unbonded) tungsten carbide, WC	1800
Crystalline aluminum oxide, Al_2O_3	2000
Primary (unbonded) titanium carbide, TiC	2470
Silicon carbide, SiC	2500
Titanium boride, TiB_2	2700
Boron carbide, B_4C	2800
Diamond, C	6500

Values on all the cemented materials vary widely depending on the proportion of metal phase used in the composition. The tougher grades containing more metal are softer.

What are ceramics?

Authorities don't agree on the precise definition of a ceramic. Some say it's a matter of crystalline structure (as distinct from amorphous glass); others say with Webster that it's a matter of firing "earth materials"; others say it's a matter of complex compounds. Generally, oxides are ceramics—ranging from a single oxide to a complex combination. Let's say the cemented carbides and borides are cermets—bonded materials combining metals and ceramics—and the typical oxide cutting materials are ceramics. Actually, oxides with metal binders would also be classifiable as cermets rather than true ceramics. The lack of heat conductivity of the ceramic materials are distinctive to them, however—they are not shared by carbides or borides.

Basically, a ceramic is brittle—has no impact resistance worth talking about. Ceramic toolbit materials have crystalline structure, making them very hard. They have very high abrasion and erosion resistance (hence resistance to cratering) because of their hardness, and high compressive strength. Bending strength is considerably lower than that of cemented carbides, but hardness and high-temper-

*Transactions of the ASM, Vol 38 (1947), pp 371 to 378. There are two articles, the first by Thibault & Nyquist and the second by Tarasov & Thibault. Additional subsequent data are from Thibault's files, with exception of the value for diamond which is based on NBS data.

ature strength are considerably higher. Heat conductivity is very low—lower than that of carbides, so unequal heating causes cracking and shattering. This means trouble in applying a cutting fluid and resulting alternate heating and quenching from chip interference with the coolant stream. It also makes for trouble in trying to braze the tip by normal methods, although glass "solders" or fired-on metals have been used abroad. Epoxy resins may eventually work because of the low thermal conductivity of oxides. The tendency to break means the holder must be designed to minimize mechanical stresses (such as bending) and to avoid stress concentrations by providing large areas of perfect contact surfaces. One way to do this is to support the bit on high-rigidity tungsten-carbide (this also reduces Brinelling under load) and to clamp with a band, strap or very-rigid bar. (A companion problem is to design the holder so it is not damaged when the cutting tip cracks.)

Strangely, ceramics have inferior low-temperature strength coupled with good high-temperature strength. This permits running dry, and on most present tests this has been done. A point here worthy of note is that ceramics may prove useful in so-called "hot-spot" machining.

Here is a bit that runs *b*·*tter* than carbides at higher temperatures. Now if a machine can be made to stand the heat, all cutting can theoretically be done at optimum temperatures. Cutting fluids are not necessary for the bit; they are needed primarily to protect the work.

Another characteristic of ceramics is that they are heat insulators, so they don't absorb heat as metals do. This leads to the "peculiarity" noted by observers—that the tip remains "cool" to the touch even after what appears to be a heavy cut. Also, the chip does not "weld" to the tip because the latter is a non-metal (and because surface speeds are usually too high). Ceramics are also non-absorbent, acid-resistant and unaffected by corrosion. They are non-magnetic and non-conductors—important in avoiding contamination of dielectric and insulating materials. However, ceramics permit speed and feed combinations—if the machine is rigid enough—well beyond the capacities of most present machine tools. They do, however, offer better finishes and higher speeds within the limits of present machines.

Tool sharpening

Russian reports indicated oxide tools are reground much as carbides are, with a green silicon-carbide wheel having a ceramic bond, 46, 60 or 80 grit, hardness I to J (but not exceeding K). Black silicon-carbide wheels should be one or two grades softer than equivalent green wheels. Wheel surface speed is 2000 fpm. Lapping is done on a cast-iron disk, with boron-carbide paste, at 300 to 400 sfpm.

Rodman Lab tests, on the other hand, showed difficulty in sharpening with any SiC wheel, perhaps because American ceramics are harder. Diamond wheels of 150 to 320 grit gave a lustrous finish, and a 320-grit hand hone removed the feather edge. Bit bottoms were ground flat to avoid poor seating and consequent cracking.

Norton recommends dry grinding with metal-bonded diamond cup wheels, 150 grit for forming or roughing, 320 grit for finishing. A 7° negative land is applied with a vitrified-bond diamond hand hone. Carboloy grinds with a 220-grit diamond wheel, wet. Carborundum recommends roughing with 180-grit, resinoid-bonded diamond wheel, fin-

Some test runs with cemented-oxide tools

Material Cut	Speed, sfpm	Feed, ipr	Depth of Cut, in.	Bit
SAE 4140 steel (183 Bhn)	1200	0.008	0.125	Norton
SAE 4140 steel (300 Bhn)	910	0.008	0.250	Norton
Like AISI 1040	1500	0.005	1/16	Carboloy
SAE 8647 forging	1950	0.011	0.060	"
Forged steel	2000	0.0065	0.032-0.062	"
AISI 1040 forging	2200	0.003	0.060	"
AISI 1045 forging	2500-3000	0.0065	1/16	"
SAE 6145 (R. 18-22)	1250	0.0105	0.100	Stupalox
SAE 4140 (R. 28-32)	1000	0.0105	0.100	"
Meehanite A casting	1000	0.021	0.250	"
Meehanite A flame-hd	1000	0.015	0.100	"
Ampco Bronze 21	600	0.0085	0.100	"
Ampco Bronze 19	800	0.015	0.100	"
CI spheroidized	1050	0.015	0.100	"
Maxwell TS	1000	0.010	0.125	"
Ductile iron	1250	0.020	0.125	"
Nimonic 80-A	40	0.005	0.100	"
SAE 6150 bar	1250	0.020	0.100	"
Steel	400	0.015-.030	0.030-0.080	Russian
Chilled gray iron	670	0.006	0.100	"
0.30-C Steel	600	0.008	0.100	"
0.40-C Steel	550	0.012	0.200	"
0.14-C Steel	1100	0.010	0.120	"
Stainless (12-14% Cr)	600	0.010	0.160	"
Tungsten Steel	1200	0.009	0.100	"
0.25-C	900	0.016	0.120	"
1.0-C Steel	1100	0.012	0.080	"
SAE 4140	950	0.008	0.125	Norton
SAE 4140 (300 Bhn)	910	0.012	0.250	"
SAE 4140 (best run)	1200	0.012	0.125	"
Brass	650	0.010	0.125	"
Cast iron	300	0.010	0.125	"
SAE 1045 (170-210 Bhn)	900	0.005	0.100	Carboloy
SAE 4340 (260 Bhn)	485	0.010	0.125	"
HSS 207-B (annealed)	505	0.023	0.125	Stupalox
SAE 1035	1175	0.015	0.250	"

ishing with 220 or 320 grit. U S Ceramic Tile suggests resinoid-bonded diamond wheels, 100-grit for roughing and 400- to 500-grit for finishing, points out that green SiC wheels remove stock very slowly. In either case, copious coolant is recommended. Honing is recommended by all as essential to minimize "notch senstitivity." A radius of 0.002 to 0.003 is put on the edge, preferably with diamond pastes, although very-fine-grit green silicon-carbide wet sanders or abrasive belts are also used.

Ternary boride

The program at American Electro Metal Corporation (*AM*—Feb 16 '53, p117 & Apr 13, p150) resulted in the development of a boride cutting-tool material which was reasonably satisfactory. Three different compositions were prepared which showed varying new properties and which could be further developed into various grades of tool materials for specific performances. All these materials contained a ternary boride compound consisting of molybdenum, nickel and boron. The presence of this new chemical compound proved to be important for good cutting performance.

This material was actually more similar to the carbides than to the oxides mentioned above. Quite hard, this boride tool showed greater bending strength than the oxides, a heat conductivity nearer to that of tungste. carbide and a generally more metallic behavior. In addition, these tools could be very readily brazed to the supporting steel shanks. However, they are rather brittle and tests were made only with uninterrupted cuts.

These boride tools were prepared by the methods for powder metallurgy. Complicated shapes and sharp angles could easily be machined if the material was in a half-hard, presintered state, after which they could be finished by final sintering to the desired exact shape. Grinding or regrinding of cutting edges could be done only with diamond wheels.

Cutting tests were run on steel, cast iron, brass and aluminum; comparison was made with standard commercial carbide tools. Rigid support for the boride tools was found to be necessary for good performance. Best results were definitely in the range of commercially available carbide materials, but it should be remembered that final evaluation of this material can only be made after exact cutting conditions were established. A number of tests have been made by outside companies, generally confirming the results obtained at American Electro Metal Corporation.

Grain size of the material is still too coarse, but further developments will overcome this handicap. The raw material is considerably cheaper than that used for tungsten carbide-cobalt composition, and the production cost should not be much different from that for standard materials. A lot of work is still required, however, to make this tool material commercially acceptable. One advantage of tools of these compositions will be the case with which they can be fixed to steel supports. Cutting performance and tool geometry is shown in an attached table.

Titanium diboride

Second of the boride materials on which we thus far have data is titanium diboride, produced by Rand Development Corp, Cleveland. Rand became interested in borides as an offshoot of work on high-temperature metals for rockets and jet engines back in 1952. First tools, based on titanium, showed extremely good cutting and wearing properties, but lacked workability, couldn't be brazed to a shank, and were very brittle. Work since then has been toward better ductility.

Present borides are chemical compounds made from titanium hydride and elemental boron, plus alloying elements, added to the mixture later. The two are mixed in a tank, heated to 1100 C to start an exothermic reaction that forms titanium diboride. Cooling, crushing, and grinding to 1-micron particle size follow, then the boride is mixed with alloying materials, cleaned and sintered. Melting point is around 5000 F, and the material shows best in high-speed machining of high-hardness steels, in wire-drawing dies (much lower coefficient of friction than tungsten carbide), and possibly in bearings which must primarily be hard. It's of no use on rough

Data Given Here . . .

appeared in the listed *AM* articles, or were contributed by companies mentioned. This text was checked in detail by engineers of:

American Electro Metal Corporation

Carboloy Dept, General Electric Co

Norton Company

Rand Development Corporation

Stupakoff Div, Carborundum Co

TESTS ON MOLYBDENUM-NICKEL BORIDE TOOLS

Side Rake 0°, Back Rake 0°, SCEA 30°, ECEA 8°, Side Relief 8°, Nose Radius 0.030"

Material	Feed, ipr	Depth of Cut, in.	Speed, sfpm	Time, Min	Flank Wear, in.
Aluminum	0.010	0.100	450	23	None
Brass	0.010	0.100	765	11	None
Cast Iron	0.010	0.100	200	10	0.012
" "	0.010	0.100	130	114	0.020
Steel	0.010	0.100	230	11	0.002
$R_c = 60$	"	"	215	37	0.003
	"	"	210	95	0.007

CUTTING TESTS WITH TITANIUM DIBORIDE

Material	Hardness	Feed, ipr	Depth of Cut, in.	Sped, sfpm	Time, min.	Flank Wear, in. Boride	Carbide
SAE 1020	142 Bhn	0.010	0.100	600	20	0.015	0.024
SAE 1020	142 Bhn	0.010	0.050	700	14	0.024	0.013
SAE 4140	200 Bhn	0.0071	0.100	400	40	0.021	0.032
Valve seat	R. 65	0.002	0.025	50	30	0.016	0.015
" "	"	0.002	0.025	100	20	0.023	0.032
SAE 4140	200 Bhn	0.010	0.100	400	50	0.026	F @ 26 min.
B 1112	130 Bhn	0.015	0.050	650	5	0.032	0.008
B 1112	130 Bhn	0.010	0.050	700	10	0.036	0.016
B 1112	130 Bhn	0.010	0.050	800	10	0.040	0.028
SAE 4340	R. 49	0.010	0.050	250	20	0.012	F @ 10 min.
SAE 4340	"	0.010	0.050	300	35	0.014	F @ 5 min.

castings, interrupted cuts, rock drilling, and in machining titanium (a chemical reaction occurs).

Basic raw materials are cheaper than those for tungsten carbide, and not as critical, but handling and forming are costlier. Density is about half that of WÇ, so cost is assumed to be 50% as a raw material. Tools are usually hot-pressed in a die. Experimental lots are made in carbon molds, heated by induction, hot-pressed to shape, and then retrieved by splitting away the mold. This gives a "forged" bit, in contrast to the "cast" look of sintered bits.

Tests have been run at the Thompson Products Research Laboratory, Cleveland. Tools were considered dull when flank wear reached about 0.032 in. Tests were run dry on a 20 x 48-in. American *Pacemaker* lathe with clamp-type holder. The results are shown on an accompanying table.

All these tests were comparison runs with a standard carbide of steel-cutting grade. The boride showed better on harder materials. Note much poorer performance on B1112, but far longer life on 4140 and 4340, where carbide tools failed in 5 to 26 min—20 to 50% of the total run. Repeatability was good.

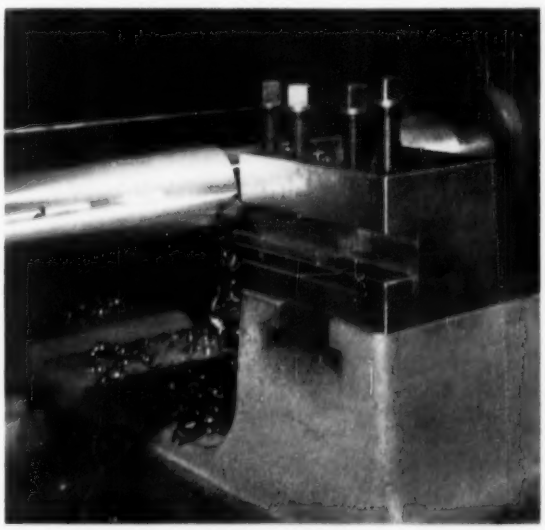
When and how much

Guesses on the future for ceramic and boride tools range all over the lot. A carbide maker from Europe says carbide suppliers will have "ceramics in their left-hand pockets," ready for the "occasional job that carbides can't handle." Other engineers see extensive use—and quickly—because of current problems in automation.

The development of cemented carbides may provide some clue. Carbides were first introduced about 1928, but it was not until World War II forced tremendous emergency production of hard-to-work materials that carbides really caught on. Machine tools of 1939 design were powerful and rigid enough to use them economically; those of 1947 used them much more efficiently.

The ceramics may create the same problem all over again, because they demand maximum rigidity and can use high power from the machine tool.

Also, the oxides are still very new—extensive development must accompany their further application. Present ones sacrifice some hardness to reduce brittleness.



High finish . . .

. . . is a characteristic of surfaces cut with oxide bits. This is a strobelight photograph of very high-speed turning under laboratory conditions at Carboloy. Tool angles are such that chips curl downward

Lastly, there's the matter of user inertia. Many shopmen resist change, particularly one of the type in which the new material is harder to use and easier to ruin than the old. They stick to the tried and true as long as possible, in an effort to restrict problems to a limited and familiar area. The big mass producers and progressive smaller producers will use ceramics promptly and effectively in combination with carbides, just as they now use carbides with HSS, and the ultimate effect will be good —*we will use carbides more effectively*, just as the introduction of carbides shamed HSS users into approaching optimum machining rates with HSS instead of dallying along at cut-and-try speeds.

Tomorrow's Cutting Tools

OXIDES •

BORIDES •

NITRIDES •

SILICIDES •

CARBIDES •

. . . a roundup on

Extensive research and experimentation give us a 3-D picture of these materials today, and a good idea of their potential. Ceramics already show great promise, and have been production tested; the others are farther away. Here is an analysis of developments to date, and pratical suggestions for application

H J SIEKMAN,
engineer in charge, Machinability Lab.

DR E W GOLIBER,
senior research chemist,
CARBOLOY DEPARTMENT,
GENERAL ELECTRIC CO, DETROIT

and K W STALKER,
supervisor, Process Development Unit
JET ENGINE DEPARTMENT, GENERAL ELECTRIC CO,
EVENDALE, OHIO

Recent developments in cutting-tool materials have made steel machining at speeds of 1000 to 2000 fpm practical. Coupled with adequate machine tools, these speeds enable production-minded men to get more parts machined in less time and for less money. The potental savings through trading lower machine, labor, and overhead costs for slightly higher tool costs are great. (*AM*—Dec 19 '55, p 121)

The more-rigid, higher-speed, higher-powered machine tools of today are essential in application of the new cutting-tool materials. High feed rates are possible with such tools, but automatic and tracer-operated machines are necessary to take advantage of them, and also automatic loading devices and materials-handling equipment. Without the latter, the minutes gained through the use of high speeds and feeds would be lost in tool-adjusting and work-handling time.

With these higher production rates come increased frequency of tool changing, for even though more pieces can be produced per tool change, that number of pieces will be produced in a very short time. Tool changes may occur every 15 min to ½ hr. This could reduce the effectiveness of the new cutting-tool materials were it not for the negligible tool-changing time with throwaway-insert holders.

Susceptibility to breakage of the more brittle new tool materials is reduced by supporting them on ground carbide seats; if an accident causes this type of failure, little time is lost or equipment destroyed because of the protection and easy indexability of the carbide seat. At present, simple silver-solder brazing techniques cannot be used to fabricate tools with the oxide or ceramic type tool materials, so mechanical holding is required.

Why these new materials?

Lighter Cuts . . . Through advancement in casting and forging methods, average thickness of stock to be machined off has been greatly reduced. The trend is to even greater economy of work materials in jet-engine alloys where material costs are high, and reduction in the amount of material to be machined from a rough piece making machining of these difficult-to-machine materials much easier. This trend to lighter cuts encourages greater use of the newer, harder, and more wear-resistant tool materials.

Harder Pieces . . . The manufacture of structural parts made of materials which have higher strength

tomorrow's tool materials

at high temperature, corrosion resistance, increased strength-to-weight ratios, and generally higher physical properties has brought about greater and greater pressure on manufacturing people to machine materials which would normally be considered unmachinable. It might be pointed out that there is practically no material that is unmachinable, for many carbides can be machined with their harder cousins, and hard carbides in turn with diamonds. It is only a case of whether it is economical to do so at the slow speeds that must be used. Tool materials have been developed that may be the only economical answer to these machining problems.

Closer Tolerances, Better Finishes . . . Longer life of modern engines and equipment, as well as higher loads and speeds, call for closer tolerances and better finishes. The more highly wear-resistant tool materials give tolerances which were once thought of as normal for grinding, and surface finishes produced by the oxide or ceramic tools have been in the order of 30 mu-in. rms.

Noncritical Materials . . . One of the major influences spurring the development and use of oxide-type cutting-tool materials is the desire to have available to American industry a tool that is manufactured from noncritical materials. This has been the object of years of German and English work in this field, more recent activity of the Russians, and that at the Watertown Arsenal.

Reports of application of ceramic-type cutting tools to machining of SAE-4140 steel by the Watertown Arsenal's Rodman laboratory[1] flushed the subject out into the open in America. Many people have been working on ceramic-type cutting-tool materials unnoticed for years, and the Arsenal's report brought these to the attention of industry.

Parallels carbide development

Modern high-speed machining was made possible by introduction of the cemented carbides about 30 years ago. Preparation of the single carbides by the chemist and development of cobalt-cemented tungsten carbide by the metallurgist may be regarded as the starting point in the history of high-speed machining. Encouraged by the success of the simple cobalt-tungsten-carbide tool materials, metallurgists soon developed the binary carbides, having improved resistance to cratering. Several years later, development of the ternary carbides permitted even higher cutting speeds. Improvements in toughness, hot hardness, etc, made during the past ten years have resulted in the excellent carbides of the present day.

Introduction of oxide or ceramic tools at this time somewhat parallels the introduction of cemented carbides by the Carboloy Company in 1929. Here we have a completely different cutting-tool material, as we did in 1929, but with the organized and scientific approach of machinability engineering to this new material, the 30-odd years which were required to advance cemented carbides to their current position may be shortened to just a few years. Much of this rapid advance will result from the more interested and higher-calibre effort of manufacturing engineers anxious to take advantage of the new materials.

The design engineer contributes to this advance by developing better machine tools—the tool engineer contributes by developing better tool holders and improved tool geometries, particularly for the

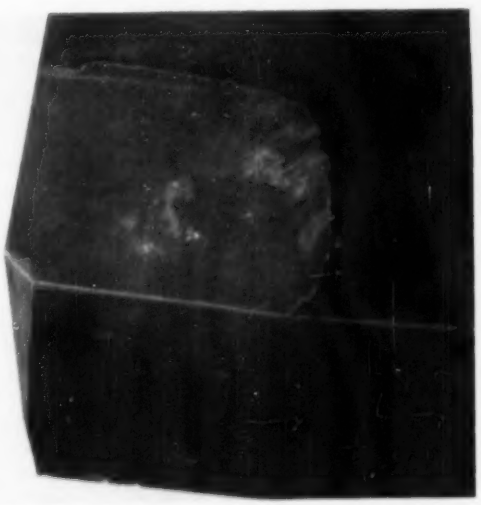


FIG 1 . . Hardness alone is not enough for a tool. Here a large diamond crystal, mounted in cemented carbide, was very successful in machining titanium alloys from a wear standpoint (Picture is 7X). After 6.5 min of cutting at 800 sfpm, 0.004-ipr feed, and 1/32-in. depth of cut, the diamond showed no wear, while the best comparable carbide was ready for regrinding in half the time. But the minute chipping of the diamond at the cutting edge, plus its fragility, make it an impractical material for such work

[1] *See bibliography, page 172, for references indicated by this and succeeding reference numbers.*

harder, more brittle, tool materials—and the chemist and metallurgist contribute by developing new tool materials.

It should be noted that hardness is not the only requisite for good metalworking tool material, as shown by the diamond-tipped tool, Fig 1. The unquestioned superiority of the cemented carbides for high-speed metal cutting is a result of their unequalled combination of toughness and hardness.

Nevertheless, the development of more powerful machine tools, which operate with less vibration, and recent advances by the tool engineer have encouraged development of the harder, more-wear-resistant, but also more-brittle, high-titanium-carbide tool materials. Further improvement may be expected here.

However, when cemented carbides are developed primarily for hardness and wear resistance, their strength falls appreciably and reaches a level almost equalled by that of materials such as the oxides and borides. Recognition of this has stimulated development of these materials for some years, and the metalworking industry has suddenly become aware that during the past ten or fifteen years, chemists and metallurgists have been patiently laying the groundwork for new tool materials.

It has long been recognized that not only the carbides, but also the borides, the silicides, the nitrides and certain oxides have the required hardness, and as such are potential building blocks for new tool materials. Like the pure carbides, these pure substances lack strength by themselves, and successful means of bonding or cementing them into strong bodies like the cemented carbides were lacking. Even "cementing" of the hardest carbides—boron carbide and silicon carbide—has not yet been satisfactorily accomplished[1, 2]. Accordingly there are now no promising tool materials based on these two carbides. Because of the great potential here, however, these hard carbides are worthy subjects for continued research.

Borides remain too brittle

Greater success seems to have been attained with the borides[3, 4], and boride compositions have been developed which approach the hardest carbide grades in strength. These boride compositions, therefore, have been the subject of machinability tests in several laboratories, including those of the American Electro Metals Corporation, the Watertown Arsenal, and the Carboloy Department[1, 5, 6]. Although a favorable comparison can be made with the stronger carbide grades from a wear standpoint, a more realistic comparison with the hardest carbide grade is not so favorable. Furthermore, they appear to be extremely brittle. Accordingly, today there appears to be no significant area where these boride compositions will outperform the recommended carbide grade.

From a metallurgical viewpoint, the borides offer considerable potential. Unlike the carbides, however, the borides enter into numerous complex reactions with the binder or cementing metals—an occurrence which apparently embrittles the binder phase and weakens the over-all structure. The development of successful boride cutting tools will apparently have to wait until these complex reactions have been resolved. This work is being continued by the Armour Research Foundation in a program sponsored by the American Society of Tool Engineers.

Silicides and nitrides

The silicides have been studied extensively in recent years. Materials developed thus far are extremely brittle and are hardly suitable for consideration as tool materials even for test purposes. The present status of nitrides as tool materials is about the same as that of the silicides. These latter two materials have been mentioned to indicate their potential as building blocks in future tool materials, but thus far they have yielded scarcely anything worthy of consideration.

A quick review of oxides

Development of ceramic or oxide tool materials has been quite extensive, although this effort apparently has escaped the attention of most tool engineers until very recently. Use of ceramic work tools, of course, predates the industrial era. Even in modern times the sintered oxides were considered for tool materials prior to the introduction of the cemented carbides. In more recent years, particularly during the last war, effort was increased in this area becaues of a scarcity of the metals used in cemented carbides.

In the early 1940's, for example, surprisingly favorable results were reported for oxide materials, ie: "considering the nature of the (oxide) cutting element, the tests appeared surprisingly favorable."[7] The report concluded that "the unique cutting characteristics of the material . . . tend to justify continued investigation." A later test[8] concluded that "we find it to be excellent from the standpoint of wear resistance." Furthermore, good treatment of the subject appears in a German book[9] on "Oxide Ceramics" (1948). More recently, a paper[10] presented at the Fifth International Mechanical Engineering Congress in 1953 contains data to show that "an oxide tool is capable of turning carbon steel . . . for a longer time and with a better finish than any known carbide." Finally a decade of research on oxide tool materials is reviewed in "Research Science" 1954[11]. In view of these results, which appeared over a period of about ten years, it is surprising that this subject suddenly created so much interest among tool engineers in this country early in 1955.

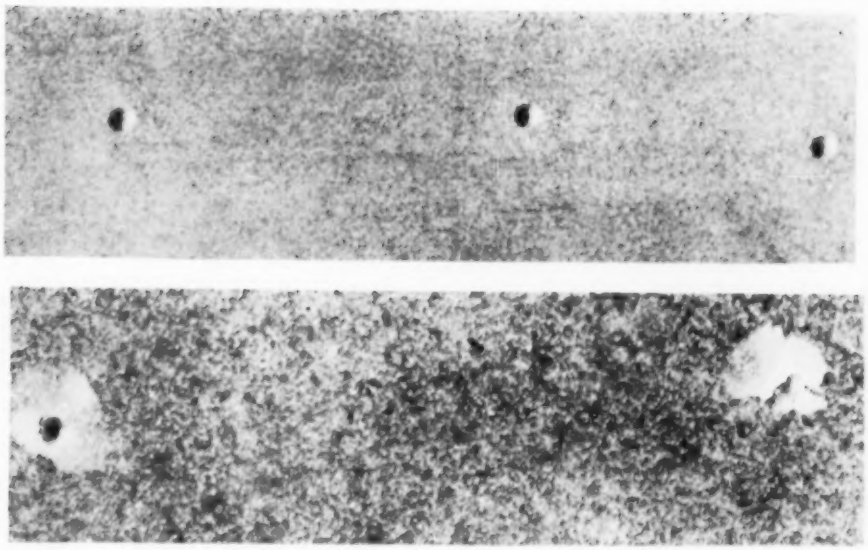


FIG 2 . . Greater resistance to chipping is shown by this comparison of Rockwell A hardness indentations in cemented oxide 0-30 (top) and a typical ceramic (below)

One might also question why oxide tools are not in greater use today. A careful study of the subject will reveal that the over-all performance of oxide and ceramic tool materials actually has not been good compared to carbides, indicated in the reports mentioned above by such concluding statements as "although the tools resist wear they are not reliable because of chipping," "we do not conceive any application where it can satisfactorily replace carbides," and "the material was inconsistent to an extent that in our opinion it absolutely precluded its commercial exploitation."

Although an occasional engineer was impressed upon first seeing the performance of ceramic tools, it was nevertheless the consensus among tool manufacturers who had tested them here and abroad that ceramic tools which would compete with carbide tools had not been developed prior to 1955. It was also the consensus that further research should be directed towards improvement of the basic ceramic material, for if a significant improvement in strength can be achieved a very useful material should result.

The Carboloy Department made several unsuccessful attempts in this area during the past ten years. Encouraged by a promising idea for producing stronger oxide tool materials, a basic program of research was again initiated in 1951. Subse-

***table I . .* PHYSICAL PROPERTIES OF CARBOLOY CEMENTED OXIDE 0-30**

Transverse Rupture Strength (5/8" centers—1/4" x 1/4" bars)	80,000-100,000 psi
Hardness (R_A)	93-94
Hardness (Knoop—750-gm load)	2051-kg/mm^2
Density	4.10-4.20 gms/cc
Coeff of Expansion (25-100 C)	6.3 x 10^{-6}
Coeff of Expansion (25-1000 C)	7.5 x 10^{-6}

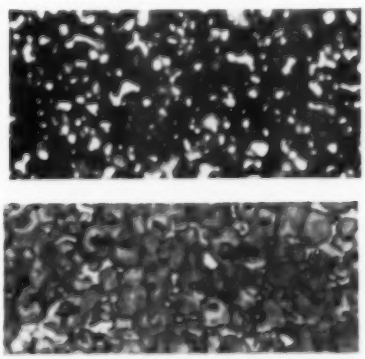


FIG 3 . . Microstructure of cemented oxide 0-30 (top), compared with that of cemented carbide 831 (below) shows much smaller grain size of the oxide—between ½ and 2 microns. Both pictures are at 1500X

***table II . .* COMPARATIVE STRENGTH AND HARDNESS DATA FOR CEMENTED CARBIDE AND TYPICAL CERAMICS**

MATERIAL	TRANSVERSE RUPTURE STRENGTH		R_A HARDNESS	KNOOP HARDNESS (750-gm load)
A	44,000 psi	(av 2 test bars)	85.1	
B	46,000 psi	(reported)	90.0	
C			90.0	1949
D	69,000	(1 bar)	90.2	1638
E	61,000	(av 3 bars)	92.2	2059
F	51,000	(1 bar)	88.2	
G	61,000	(1 bar)	88.9	1498
H	90,000	(av 20 tests)	93-94	2051
BSA-Sintox	38,000	(3 bars)	86.4	1481
Microlite (Rus)	to 64,000[12]	(reported[12])	92-93[12]	
Cemented Carbide Grade 831 (Class C-8)	100,000 min		92.7	1959

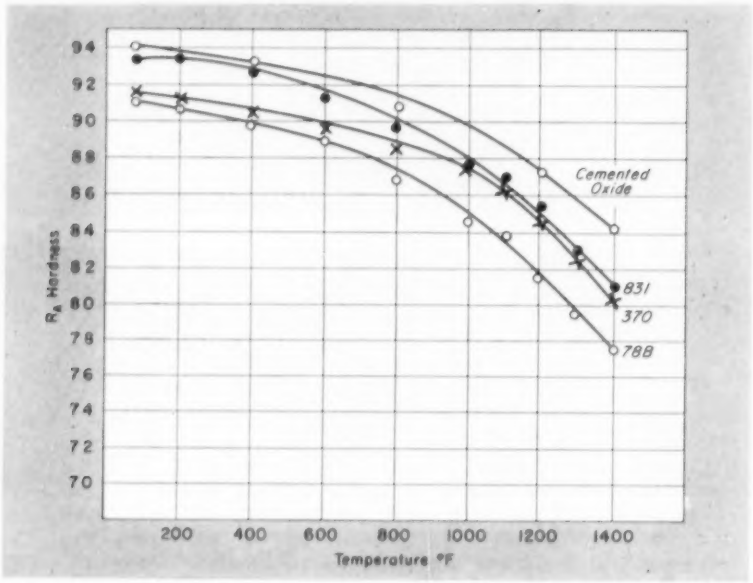


FIG 4 . . Comparative hardness of cemented oxide 0-30 and various cemented carbides at various temperatures. Note also how new grade 370 carbide is improved over older 788 in hot hardness

quently, a material was produced having a superior combination of strength and hardness and greater resistance to chipping, Fig 2. Some of its more important physical properties are summarized in Table I. The material is essentially a two-phase structure having a very small grain size, Fig 3.

Strength and hardness of the best ceramic tool materials under test in this country since the beginning of 1955 are given in Table II. Because transverse rupture test data depend to some extent upon test conditions, an attempt was made to test under identical conditions in the Carboloy Laboratories. Transverse rupture data are best represented as an average of a number of tests. As most of the materials shown are not yet commercially available, in some cases only one test was available for transverse rupture testing. Although a single test is not as reliable as is desired, the data offered is the best available. Transverse rupture data was obtained by methods commonly employed for testing the cemented carbides and as such it can be directly compared to the data given for the cemented carbides. These methods differ somewhat from those generally employed by ceramists and yield a somewhat higher figure.

The Rockwell A hardness test is not a reliable method for measuring the hardness of the typical ceramics because considerable chipping generally results. Data given here is not a true comparison of hardness alone, but is offered as a comparison of combined hardness and resistance to chipping. Hardness alone is better indicated by the Knoop hardness data given in the last column. Except where indicated, all data was obtained under identical conditions by the Carboloy Laboratories. This list undoubtedly includes the best conventional ceramics that can be produced by today's technology. Furthermore, the hardness data, Fig 4, indicate that cemented oxide is harder than the hardest Carboloy cemented-carbide grade, particularly at elevated temperatures. Machinability tests indicate an advance in metal-cutting tool materials.

It should be pointed out that all valid comparisons between cemented oxide or ceramics and cemented carbide should be carried out using carbides in the hard precision-finishing category (C-8). As cemented oxide and ceramics to date are only being recommended for machining this type of work, they cannot be reasonably compared to all-purpose or roughing grades of carbides.

From a material-development viewpoint, Carboloy cemented-oxide 0-30 should not be considered the final result of this research program, because actually it was the first material to emerge from this program which was submitted for metal-cutting tests. There is reason to believe that it will be the basis for the development of significantly better materials of this type in the future.

Importance of tool-tip temperature

Physical properties of most materials are measured at room temperature, so this information is somewhat misleading in comparing them, when we consider the conditions under which cutting tools operate. The average temperature of the tool-chip interface runs from 1000 F for average cutting conditions up to about 2000 F[13] for high-speed cuts, Fig 5. Recent work published by Chao & Trigger[14], Fig 6, gives an estimate of temperature distribution across the tool-chip interface for normal operating conditions. Here at a speed of 456 sfpm, the average tool-chip interface temperature was measured at

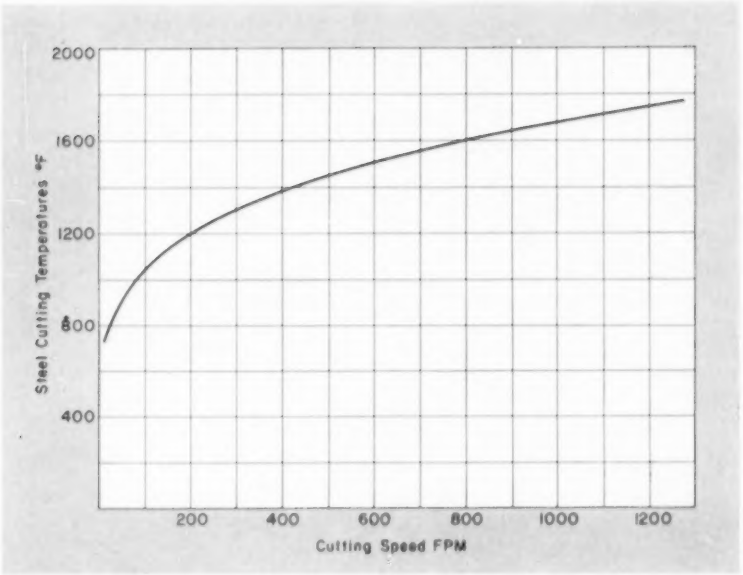


FIG 5 . . Typical tool-chip interface temperature as cutting speed is increased[13]

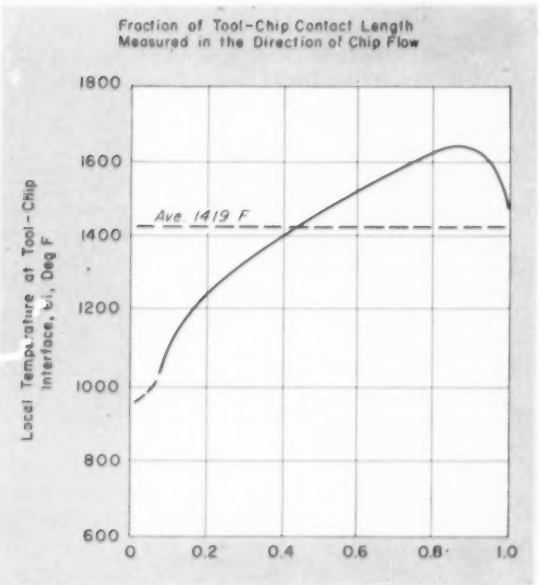


FIG 6 . . Temperature distribution on the tool-chip interface[14]. Conditions: AISI-4150, 197 Bhn, steel-cutting carbide grade, tool shape 0-6-7-7-10-0-0-.015 in. Depth of cut 0.125 in., feed 0.006 ipr, speed 456 sfpm. Interface temperature (av) as determined by tool-work thermocouple (av 5 readings) is 1385 F

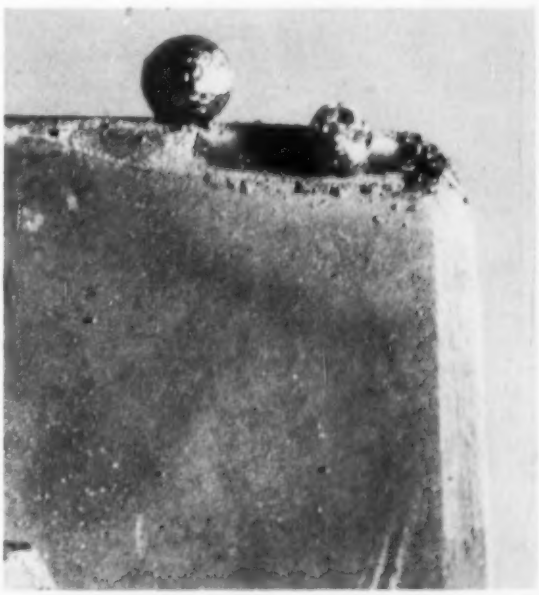


FIG 7 . . Visual proof of the high maximum tool-chip interface temperature are these two balls of steel, lightly adhered to the cutting edge of the tool, after a light chip was formed as the tool was removed from the cut. Speed was 2000 sfpm on AISI-1045

1385 F and calculated at 1419 F, while the maximum was calculated at 1650 F. With ceramic and cemented-oxide tools at 2000 sfpm, average tool-chip temperature may run well above 2000 F, giving a maximum temperature several hundred degrees higher.

It can be theorized that maximum temperature at the tool-chip interface reaches the melting point of the material being cut at the pressure involved. Fig. 7 shows two steel balls which remained on the cutting edge of the cemented-oxide cutting tool extracted from the cut after cutting at 2000 fpm. The fine chip, formed as the feed was stopped, was melted to form two balls of steel. Severity of the tool-chip interface conditions is made worse by pressures which can reach 200,000 to 300,000 psi. It can easily be seen how properties at room temperature and atmospheric pressure can lead to the wrong conclusions when comparing the performance potential of new tool materials.

Curves in Fig. 8 show the effect of increasing temperature on the hardness of high-carbon steel, high-speed steel, cast alloys and cemented carbides. Hardnesses give a rough comparison of wear resistance or tool life, while temperature of the tool-chip interface is generally proportional to cutting speed. This explains why high-speed-steel tools fail so rapidly at speeds of 150 to 200 sfpm, while cast alloys perform well up to 300 sfpm and carbides as high as 800 to 1000 sfpm. The comparison of cemented carbides and cemented oxide 0-30 at elevated temperatures, Fig 4, indicates recent improvement in properties of the newer cemented carbide (370) over the older grades (78B) as well as cemented oxide 0-30 compared to the hardest cemented carbide, grade 831, showing the trend to develop better cutting-tool materials for higher cutting speeds.

This ability to resist wear or give longer tool life at higher speeds (temperatures) is shown on the tool-life graph, Fig 9. There is an increase in the slope of the tool life line between the high-speed steel and cemented carbide from 0.125 to 0.25 respectively, and an even greater increase between cemented carbide and cemented oxide from 0.25 to about 0.70 respectively. All things being equal, the higher the high-temperature hardness, the higher the slope of the tool life line, thus the greater the advantage gained by cutting at higher speeds.

Early investigations of the type of wear taking place on the cutting edge of cemented-oxide 0-30 tools seem to indicate that a combination of wear and extremely minute chipping is taking place. This type of wear appears to be in the area where minute chipping and wear merge. This, along with the possible difference in friction conditions and edge strength, may account for the apparent intersection of the tool life lines for cemented carbide 831 and

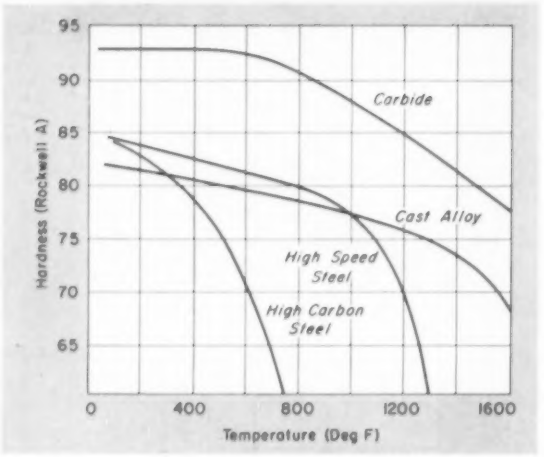


FIG 8 . . Hardness of various tool materials at elevated temperatures shows their ability to cut at higher speeds

cemented oxide 0-30 at relatively high cutting speeds (high temperature). Intersection at fairly high speed, (temperature) might also be expected as there is little or no difference in the hardness at room temperature, and divergence of the high-temperature hardness curves does not occur until higher temperatures are reached, Fig. 4

Light feeds indicated

The high pressures involved in metal cutting indicate the need for cutting materials with high transverse rupture strengths—a limitation of ceramic materials. Until the more recent materials have been developed, most ceramic cutting tools were recommended for machining low-strength materials with cutting loads lower than those for machining steel. Even today, relatively low transverse rupture strength compared to cemented carbides, however, limits the use of these materials to relatively thin chip loads and low impact load. If the apparent wear of cemented oxide and ceramic tools is a result of the combination of minute chipping and wear, a higher transverse rupture strength may account for the better tool life of the more recently developed oxides, Table II.

Even with cemented-carbide cutting tools, high-speed cutting gives an interesting distribution of heat dissipation between tool, work and chip[15], Fig. 10. The largest portion of the heat goes off with the chip, but this hot chip gives up a certain amount of its heat to the tool as it rubs over it. It has been observed that after five to ten minutes of cutting with cemented-oxide tools, the cutting edge can be touched without burning the finger. The low thermal conductivity of cemented-oxide tool materials reduces the amount of heat entering the tool to a minimum. This means an even greater percentage of the heat goes off with the chip.

Even though the percentage of the heat going into

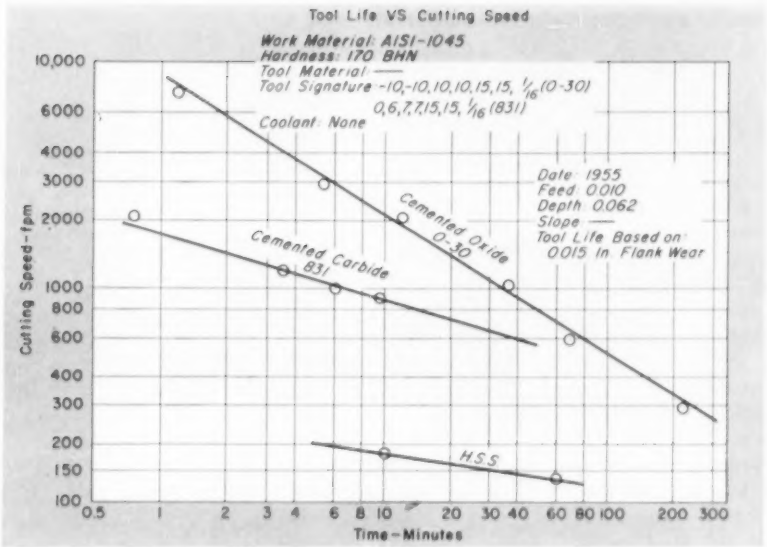


FIG 9 . . Comparison of tool life lines for cemented oxide 0-30, cemented carbide 831, and high-speed steel. Higher slope of the 0-30 tool life line shows greater increases in tool life over carbides can be obtained at the higher speeds

the work is small, the amount of power required to take a finishing cut 0.100 in. deep at a feed of 0.010 ipr and a speed of 2000 fpm is approximately 20 hp, which is 850 Btu per minute. Even a small percentage of this amount of heat in a small workpiece can bring about an increase in the work temperature.

It was hoped that the use of tool materials consisting largely of oxides, which are not wetted with ordinary metals, would result in friction between the tool and the chip somewhat less than with cemented carbides. Test data on the coefficient of friction, as measured as a ratio of the feeding and vertical forces and chip thicknesses in cutting, indicate some difference between the softer grades of carbides and cemented oxide 0-30; but in comparing the harder finishing grades of carbide to cemented oxide 0-30, there is little or no difference.

Foreign tests of ceramics

Some earlier metal-cutting tests[11] done in 1942, 1943, and 1944 using sintered-oxide tools to machine shells were reported by the British. Speeds were limited by the machine equipment available to 400 sfpm, but depths of cut were taken up to 0.250 in., and feeds up to 0.020 ipr were used. Some results, surpassing the best cemented carbides tested, encouraged later development of BSA-Sintox oxide tools, although difficulties with reproducibility and breakage were a problem in the earlier compositions. Sintox was recommended for machining low-strength, highly abrasive materials such as plastics, graphite, etc. Tests conducted by the Carboloy Machinability Laboratory[16] in 1951-1952 showed difficulties in applying this tool material to polyester glass, graphite, and transite. Later reports of success in machining cast iron and steel were also investigated, but results indicated that carbides still seemed to be by far the easiest and most practical tools to use.

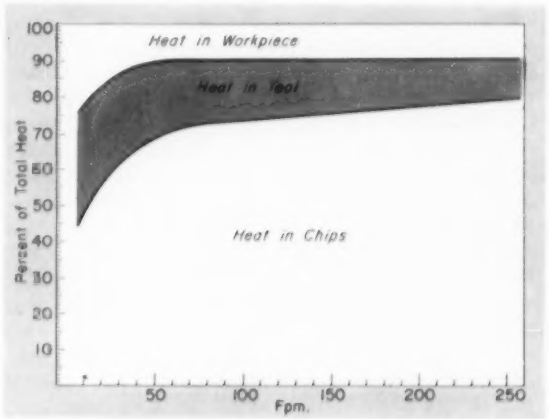


FIG 10 . . Distribution of heat in work, tool, and chips at various speeds[15]

The Russians have been reported[12] using a ceramic-type cutting tool material, TsM-332, since 1951, which is sometimes referred to as "Microlite." In work on locomotive axles, cutting speeds have been raised from about 600 fpm using a general-purpose grade of carbide, T15K6, to over 1000 fpm using TsM-332. Machining times have been reduced 50% on steels in the 250 to 300 Bhn range and working capacity increased four times over using the hardest finishing grades of carbide T30K4 and BK8. Surface finishes were also improved.

Tool geometry

Early test results on cemented oxide 0-30 cutting tool materials indicated that negative rake angles of about 10° gave longer tool life. Honing of the cutting edge also improved tool life. This type of tool geometry increases the ability of the tool material to absorb shock on entering the cut at speeds of 1000 fpm and higher. Relief angles of 10° gave

about twice as much tool life as 5°. To take advantage of high production rates with cemented oxide, cutting speeds above 1000 sfpm must be used in machining steel similar to AISI-1045, Fig. 9. Although the tool may need changing after 15 min at 2000 fpm, it has produced as many pieces as cemented carbide tools running for one hour at 600 fpm.

To maintain this 4 to 1 production advantage, the tool must be changed easily and rapidly or else the advantage will be dissipated by the cost of changing the tool. To facilitate this rapid change, throwaway insert holders, Fig 11, were used which gave the ½ x ½ x 3/16-in. throwaway cemented-oxide 0-30 blanks a tool geometry of negative 10° back rake, negative 10° side rake, 10° end and side reliefs and 15° end and side cutting edge angle. Nose radius was 1/16 in., and the cutting edge was honed to a 0.002- to 0.005-in. flat. A chipbreaker gap of about 1/16 in. gave chip control from 0.002 to 0.010 ipr feed. Above this feed, a gap of ⅛ in. is recommended. The carbide seat gave a rigid, flat supporting surface, and if breakage of the nose of the tip occurred, the seat protected the holder from damage. If the corner of the seat were damaged, it could quickly be loosened and indexed to another corner and production continued. The ½-in.-square tips can be used on all eight edges and thrown away, thus eliminating regrinding of the cemented oxide. This holder gives ideal tool geometry along with quick tool changing. Standard 5° negative rake throwaway-insert holders will also give good performance. Carboloy cemented-oxide 0-30 inserts, Fig 12, are commercially available to fit these types of holders.

Normally, if wear lands are allowed to increase to amounts of 0.030 in., as in cemented-carbide tools, major damage may occur to the cemented oxide 0-30 tip. Maximum wear lands of 0.015 to 0.020 in. are currently recommended, at which time the tool should be reground or the tip indexed.

Feed and depth of cut should be kept low, for reasons previously given. Depths of cut up to ⅛ in., and feeds up to 1/64 ipr, are suggested, depending on the side cutting-edge angle and the nose radius being used. Very high side-cutting-edge angles of 45 to 60° will allow heavier feeds. Large nose radii will also help. Entry impact is one of the limiting factors on the size of the chip load possible. Entry must be smooth and controlled when heavier feeds and depths are being taken. Even then, many tools fail on, or shortly after, entry into the cut. The amount of accumulated wear on the cutting edge also increases the tendency of the tool to fail on entry. Heavier feeds also increase the rate of wear and reduce tool life so, particularly where good finishes are required, finer feeds of below 0.010 ipr are recommended.

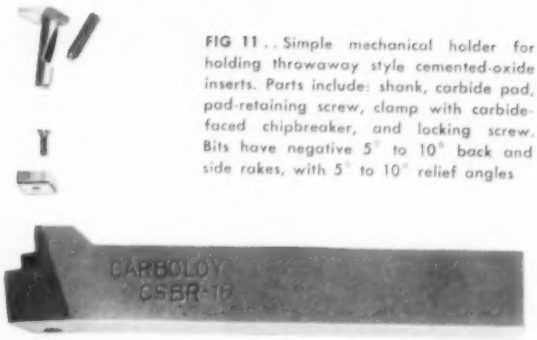


FIG 11 . . Simple mechanical holder for holding throwaway style cemented-oxide inserts. Parts include: shank, carbide pad, pad-retaining screw, clamp with carbide-faced chipbreaker, and locking screw. Bits have negative 5° to 10° back and side rakes, with 5° to 10° relief angles

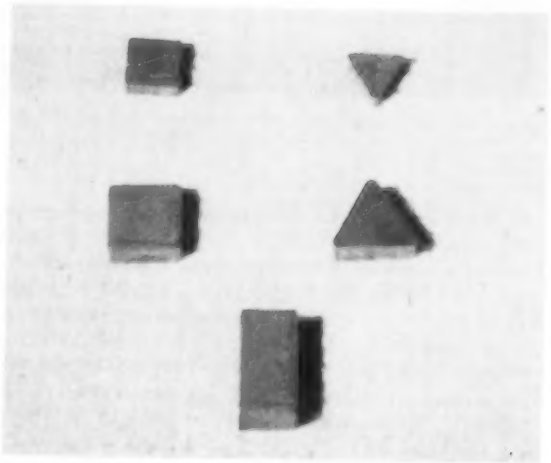


FIG 12 . . Some shapes of cemented oxide currently available. Rectangular blank ¼ x ⅜ x ¾ in., and ⅜- and ½-in. square and ¼-in. IC and ⅜-in. IC triangular throwaway inserts

Ultra-high-speed machining

On the extensive tool-life line arrived at for cemented oxide 0-30, Fig 9, it should be noted that although the tool acquired 0.015-in. flank wear in only 75 sec at 7,500 fpm, 70 cu in. of metal were removed in this time. Possible use of cemented oxide 0-30 at these speeds regardless of short tool life should not be overlooked. Fig 13 shows the cemented-carbide and cemented-oxide 0-30 tools before the test at 2000 fpm and the resultant wear after 1 min and 12 min respectively. Scattered test data on ceramic tool materials C, E, & H when machining high-temperature alloy A-286 allowed plotting of the tool-life lines in Fig 14.

Tool-life test

A simple, reproducible tool-life test was developed. It consisted of determining time required to obtain 0.015-in. flank wear on the tool while cutting AISI-1045 with a Brinell hardness of 170, at a speed of 2000 sfpm, 0.010-ipr feed and a depth of cut of 0.100 in. with a 10°-negative throwaway tool previously mentioned. Some 18 different types of ceramic

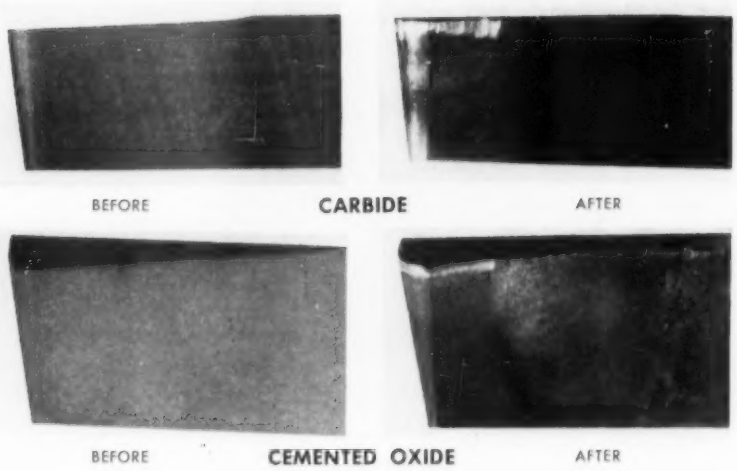


FIG 13 . . Cemented oxide 0-30 and Grade 831 cemented-carbide tools before and after cutting 12.0 and 1.0 minute respectively. Conditions: AISI-1045, 170 Bhn, tool geometry: 0-30: −10, −10, 10, 10, 15, 15, 1/16, and 831: 0, 6, 7, 7, 15, 15, 1/16. 0.010-ipr feed, 0.062-in. depth of cut. 0-30 had 0.015-in. flank wear and 831 had 0.025-in. flank wear

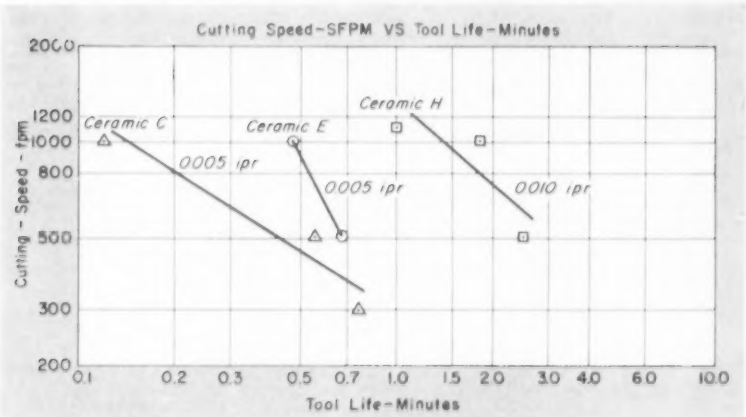


FIG 14 . . Tool-life lines for ceramics C, E, and H machining A-286 (high-temperature alloy) with a 0.062-in. depth of cut and the feed shown. Tool failure taken at 0.015-in. flank wear[17]

tools were tested, but only those listed in Table III gave reasonably good results.

If the tool were allowed to run to complete failure, some relative indication of strength and toughness was obtained. The stronger cemented-oxide compositions tested ran out to 0.026-in. flank wear in about 15 to 20 min before complete failure took place. The amount of wear acquired before complete failure occurred gave some measure of the toughness or strength of the compositions tested.

Surface finish

The surface finish produced with cemented oxide 0-30 tools is definitely better than that produced with cemented-carbide tools under the same conditions and with the same tool geometry, Fig 15. Added to the difference in finish as measured by the Profilometer there is an even greater difference in appearance. The cemented-oxide tool produces a much shinier finish. A closer look at the surface of the metal between the feed marks, Fig 16, gives some idea why the finish produced with cemented carbide at 500 fpm looks so much duller than that produced with cemented oxide.

***table III* . . TOOL LIFE OF VARIOUS TOOL MATERIALS CUTTING AISI 1045, 170 Bhn**

(Speed 2000 sfpm, feed 0.010 ipr, depth of cut 0.100 in.)

TOOL MATERIAL	TOOL LIFE, MIN	REMARKS
C	0.25	0.015 flank wear
D	0.33	Would not cut at 2000 fpm. Tested with 0.005-ipr feed @ 1000 fpm. Heavy cratering
E	1.5 to 2.0	0.015 flank wear
F	0.5	Complete failure
G	1.5 to 1.75	0.015 flank wear
H	9 to 13	Tested with 0.005-ipr feed
Sintox	0.33	Complete failure
Carbide Grade 831 (Class C-8)	0.75 to 1.0	0.015 flank wear

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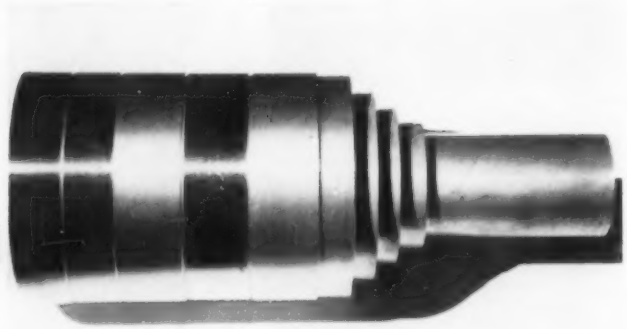
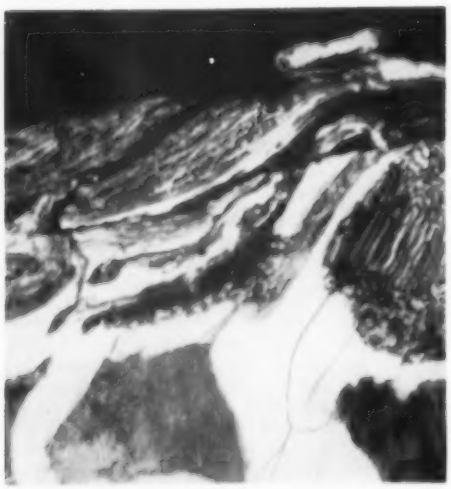


FIG 15 . . Finish obtained by machining AISI-1045 at various speeds with cemented-oxide 0-30 and cemented-carbide 831 tools. Conditions: 0.005-ipr feed, 1/32-in. depth of cut, tool signature −10, −10, 10, 10, 15, 15, 1/16

Surface (from left)	One	Two	Three	Four	Five
Tool Material	0-30	0-30	831	0-30	831
Cutting Speed, sfpm	2000	1000	1000	500	500
Surface Fin, rms	31-39	39-43	42-46	38-43	54-62



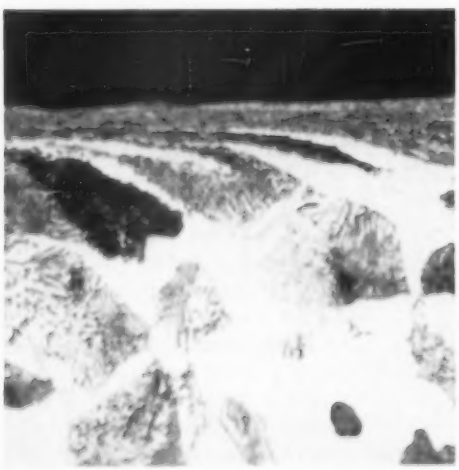


FIG 16 . . Cross-sections showing surfaces machined with cemented-carbide 350 (top) and cemented-oxide 0-30 (below). Cross-sections were taken parallel to direction of feeds with speeds at 500-sfpm, 0.010-ipr feed, 0.100-in. depth, tool signature −10, −10, 10, 10, 15, 1/16 on AISI-1045, Bhn 170. Deformation of work material below cut surface is less than 0.001 in. in each case. Note smoothness of the ceramic-machined surface compared to that machined with carbide. Magnified 1500X

If the work tends to overheat or tolerance cannot be held because of piece distortion from cutting heat, a coolant may be applied, if done properly. A large, uninterrupted flow of coolant, possibly applied from the bottom and side of the cutting tool, will not cause cracking of cemented-oxide bits and will keep the work and chips cool. Improper or intermittent application of coolant will bring about cracking and resultant breakage of the tip. It is not expected that coolant will decrease the rate of wear of the cutting edge.

Grinding tips

Grinding cemented oxide can be done with the same equipment used to grind cemented-carbide tools. Even if large sections must be removed, grinding can be done rather easily with a 220-grit resonoid-bonded diamond wheel with no difficulty and at a good rate. All grinding should be done with a good flood of coolant applied to the grinding wheel to reduce the tendency to wheel loading. If loading is avoided, plunge grinding (depth of 0.20 in.) can be taken in surface or chipbreaker grinding with no adverse effect. Grooving of the diamond wheel may be a problem though. If the wheel, in surface grinding, is allowed to load, breakage of the cemented-oxide tip will occur.

Bottoms of tips, to be held in mechanical holders, should be ground by off-hand grinding on grinders with a 220-grit resonoid-bonded diamond wheel and ample coolant. Honing of the cutting edge can be accomplished with diamond hones, but good results can be obtained with a fine-grit silicon-carbide hone. Care should be taken in honing to produce a nicely blended flat on the cutting edge. One of the major reasons for honing the cutting edge is to remove the

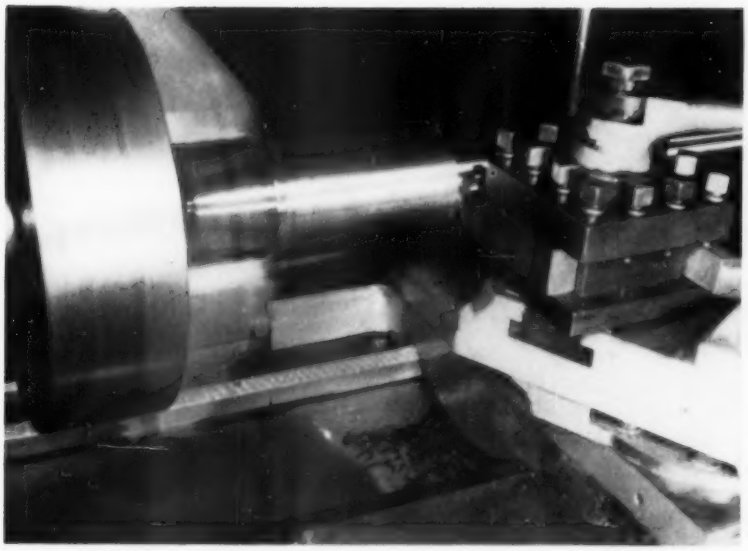


FIG 17. . Lathe spindles of AISI-1050, at 180 to 220 Bhn, were machined with 0-30 bits at LeBlond Machine Tool Company for a production test. About 0.010-in. flank wear occurred after four spindles, but eight were machined before failure. Carbide 831 produced only two under the same conditions before it was badly cratered and ready for regrinding. A tracer-equipped, 16-in., high-production lathe gave speeds of 1000 to 1400 sfpm on the 3-ft shaft of diameters from 4 to 2½ in. Tool geometry: –10° back and side rake, 10° end and side relief angles, 10° end cutting-edge angle, –3° side cutting-edge angle, 1/16-in. nose radius, honed cutting edge. Feed 0.012 ipr, 1/32-in. depth of cut. Finish on oxide-turned pieces was superior

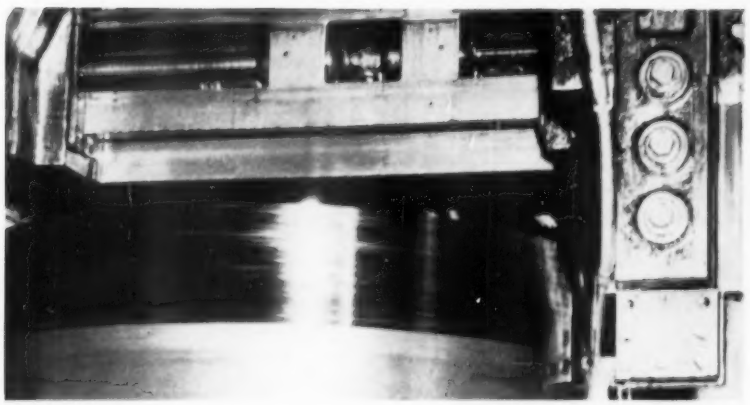


FIG 18. . Finish-turning AISI-4340 (270 Bhn) steam turbine-generator retaining rings at General Electric was done at 485 sfpm, with 0.010-ipr feed, and 0.020-in. depth of cut with a coolant. An 0-30 tool showed wear land of only 0.002-in. after a 17-min cut, while a carbide 831 tool showed 0.010-in. flank wear in only 5.5 min. Machining time on the boring mill was cut from 2 hr to 40 min on this 42-in.-dia x 23¼-in. piece

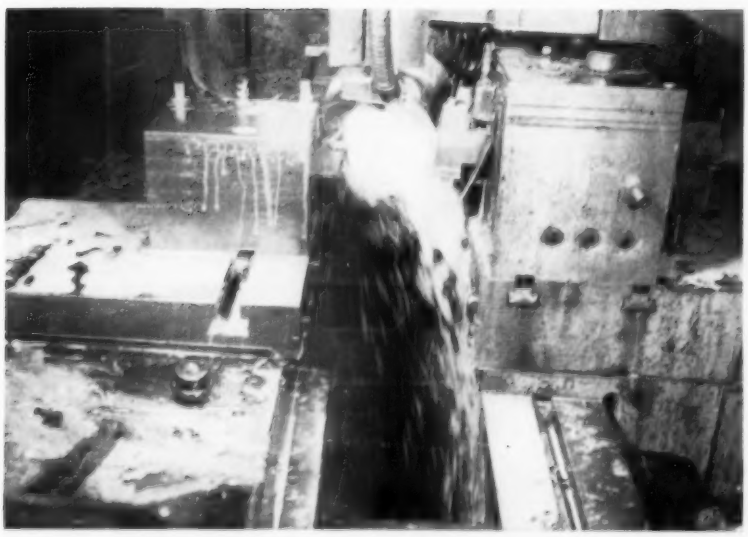


FIG 19. . Auto transmission-gear blanks were turned with over 100% longer tool life in this test. Tests on a Sundstrand 6A automatic stub lathe were restricted to 450 sfpm by a carbide grooving tool, which also made the coolant (water-soluble, 30-1) necessary. Oxide tools produced 929 pc, carbide 350. The blanks are AISI-5135 (170-207 Bhn), 0.013-ipr feed, 0.025-in. depth of cut, standard 5° negative throwaway-insert holder

minute ragged edge produced in grinding. Care should be taken in honing to produce a smooth edge, for a poor job can produce a somewhat ragged edge. Even careful grinding with finer-grit diamond wheels may produce a minutely ragged edge, and the smoothing of the cutting edge is essential to get good tool life with these materials. Throwaway-style cemented-oxide tips, as purchased from Carboloy, will already be ground and only honing of the cutting edge is necessary.

Heavy cuts possible

At the present time, cemented-oxide 0-30 tools are only being recommended for light finishing cuts on steel, mostly because the majority of our interest and experience has been in this direction, Figs 17-19. We have no idea how many other applications it may be good for. With the newer, heavy, machine tools, such cuts as 1/32-ipr feed, ¼-in. depth at 1000 fpm, Fig 20, may be possible with the modified tool geometry of high side-cutting-edge angle or lead angle. This cut was taken on a high-speed 32-in. engine lathe with a 125-hp drive motor. The cut required about 75 hp. Taking this cut at 8000 fpm would draw about 600 hp. Future developments in cemented oxides may make even heavier and higher-speed cuts possible, and machine tools will be required to utilize these cutting-tool materials. These thoughts may sound fantastic now, but this was also the opinion in 1929 when cemented carbides were first being used on machines designed for HSS tools.

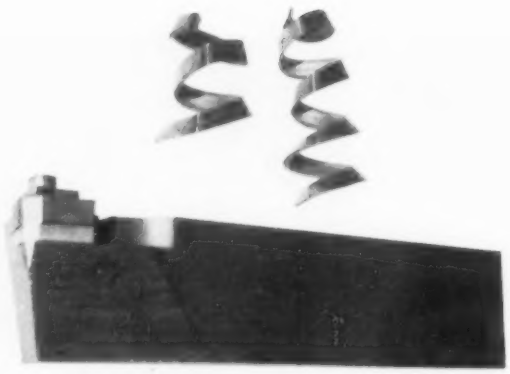


FIG 20 . . This special mechanical holder allows high side-cutting-edge angles (lead angles), hence permits cuts of ¼-in. depth and 1/32-ipr feed with oxide 0-30 on AISI-1045 at 1000 sfpm. Note chips produced

With less than one year of experience in metal cutting with cemented-oxide 0-30 tools, we have not had a chance to scratch the surface in possible applications. It will require the interest and ingenuity of industrial tool engineers to apply cemented-oxide and ceramic tools to their machining problems to get these answers.

To date, such fields as hot extrusion and wire dies, wear parts, component parts for high-temperature operation, bearings, corrosion-resistant applications, and many other uses have not been tapped. Application of these new cemented oxides to cutting tools may be only the beginning.

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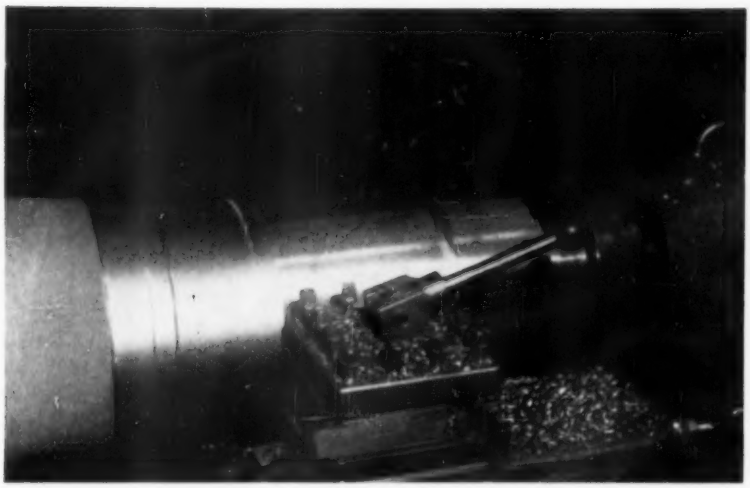


Turning at 980 sfpm . . .

. . . with a ceramic tool at Skoda Works. Feed was 0.018 ipr, depth of cut 0.275 to 0.314 in. The part is a CI cylinder liner, and the cut uninterrupted—best possible conditions—but tool life of 18 min was not as good as that with carbide. But metal-removal rate (11.5 lb) was the highest achieved with ceramic, so the toolholder was redesigned (see sketch) for greater rigidity and to avoid clamping stresses

Czechs cut cast iron with ceramics

Tests at Skoda lead to adoption of oxide toolbits in a special high-rigidity toolholder.

Here are results of tests, plus details of holder and experiences

DAVID SCOTT, LONDON, ENGLAND

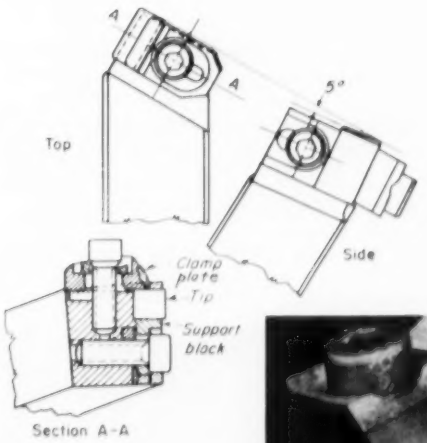
Skoda Engine Plant in Prague, Czechoslovakia, has pioneered in that country's development of ceramics for Metalworking, and is now using them regularly in production. Large cast-iron pistons with wristpin holes already bored are being turned there, and results are claimed to be very satisfactory, even on the interrupted cuts.

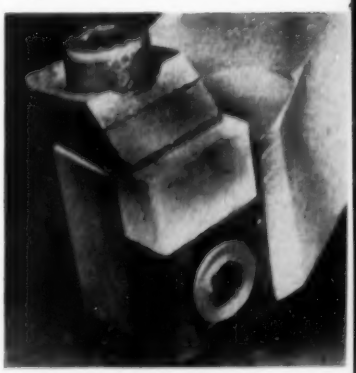
Saving of costly tungsten carbide is regarded as an outstanding advantage of using ceramic. Although Czechoslovakia is currently importing substantial quantities of tungsten from China, this is diverted increasingly to production of steel alloys. In contrast, all ingredients for the non-metallic tools are available locally, and the country has a well-developed ceramics industry of long standing.

Bits are of aluminum oxide, of rectangular sections ¾ x ½ x 13/16 in., with four corners radiused, giving a total of eight cutting edges. They are made at Nove Benatky in northern Bohemia.

Positioning of the tip is a compound angle relative to the axis of the holder shank, giving 5° negative back rake, 5° front clearance, and a 60° approach angle. Tool radius was found to be critical, especially on interrupted cuts, and was finally established at 0.98 to 0.118 in.

Considerable experimental work preceded use of ceramics for actual production machining. Early results were outlined in an inter-factory report. Tests were made on a batch of 130 CI pistons of 220





Toolholder . . .

. . . developed at Skoda for rectangular ceramic tips avoids clamping stresses and allows shifting to use four different cutting edges. Tip is tilted by holder to give negative top rake. Support block (hand finished on seat) and clamping plate (which is also the chipbreaker) are positively located by serrations; slot in latter permits height adjustment to compensate for regrinding. Clamp capscrew has radiused shoulder to equalize clamping pressure on tip

MORE ON NEXT PAGE

. . . Czech cut cast iron with ceramics

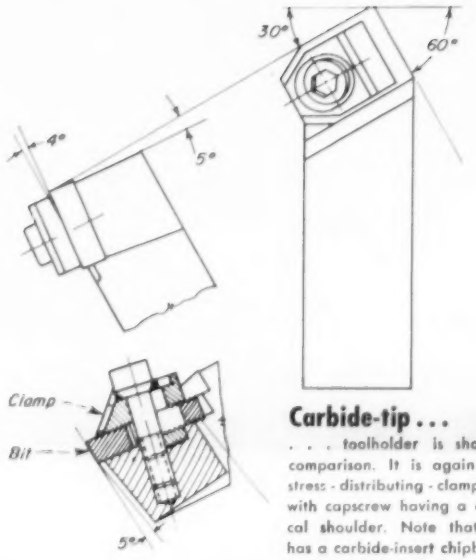
to 250 Bhn. These were mostly of 8.66 or 10.28-in. dia, with wristpin holes of 4.14-in. dia. Three of the pistons were 16.54 in. in dia and 30.71 long, with 5.37-in.-dia hole.

According to the report, preliminary test cuts were made on castings with the skin turned off. Cutting speeds started at 325 sfpm, rising to 650 sfpm. Feeds were 0.01 to 0.02 ipr, and depth of cut ranged from 0.08 to 0.6 in.

NEGATIVE-RAKE EXPERIMENTS

Considerable attention was given to the negative rake before the 5° angle was established as the optimum. A larger negative rake was obtained by using interchangeable support blocks with the top face ground to the required tilt. Various rake angles up to 15° were tried, but this was found excessive for there was a considerable force tending to push the tool away from the work, and the finish was poor. In addition, the report states, rough machining of cast iron with angles of 12 to 15° makes "an unpleasant noise which is undesirable and unbearable for the worker."

Later test runs are pictured. In production turning, the lathe operator suggested that main advantages of ceramics combined with their special toolholder was the reduced grinding time and improved work finish. Use of ceramics has now been extended to other factories in Czechoslovakia, including the CKD-Stalingrad plant in Prague. It was also learned that these holders have been successfully used with carbide tips. Export of a number of ceramic tips and holders has already been made to France.



Carbide-tip . . .

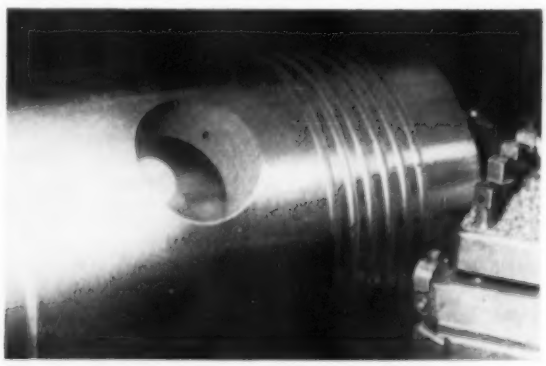
. . . toolholder is shown for comparison. It is again of the stress-distributing-clamp type, with capscrew having a cylindrical shoulder. Note that clamp has a carbide-insert chipbreaker, rather than being all carbide

Finished . . .

. . . 10.28-in.-dia pistons show quality of ceramic-turned finish. In reshaping ceramic bits 5.62 cu mm of ceramic was ground away per piston, so unit tool cost was 0.0078 Czech crowns (about 0.1 cent at official dollar exchange). Grinding time was 1 hr 21 min less for ceramic than for carbide tips on this 32-piston (each) job

Piston before and after . . .

. . . turning with ceramic tool shows a typical test run. The wristpin hole causes severe interruption in cutting, so tool life averaged about the same as with carbide but tool cost was less and finish better. On 32 pistons, 10.28 dia x 19.68 in. long, turned with ceramic tips at 390 sfpm, feed 0.025 ipr, and 0.01-in. depth, cutting time was 5 min, 8 sec per piston and one edge cut 3 to 6 pieces, with 4.2 the average. With carbides on a similar group, at 180 sfpm, 0.06 ipr, and 0.01-in. depth, carbide time was the same and 4 or 5 pistons were turned per edge



14 steps TO DESIGN A DIE

STEP 4...

How to design piercing punches

J R PAQUIN

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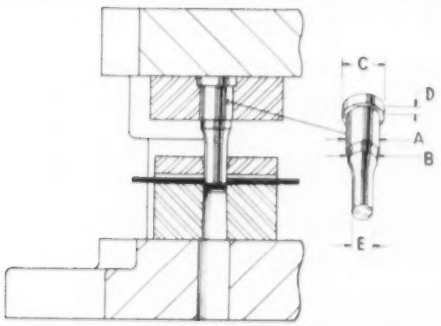
Piercing punches are usually the weakest link in any die design. Therefore, these factors must always be taken into consideration:

1..Make the punches strong enough so that repeated shock in operation will not cause fracture.

2..Slender punches must be sufficiently guided to insure alignment between punch and die members, and to prevent buckling.

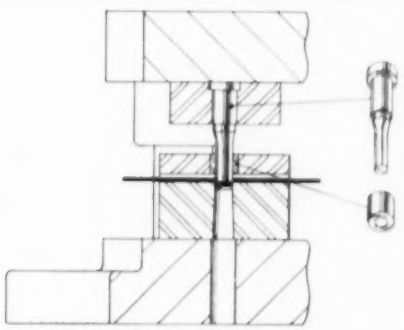
3..Make provision for easy removal and replacement of punches in the event of breakage.

Illustrated are 28 methods of designing and applying piercing punches to aid the designer in selecting the best type for the particular job. This list covers all frequently used perforators.

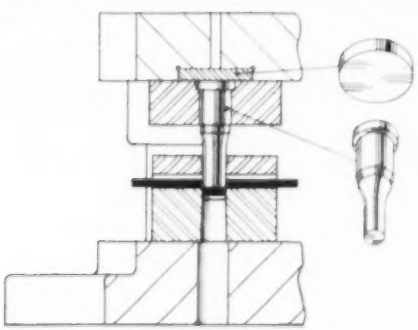


1 • • SHOULDER PUNCHES. Probably the most commonly used type, shoulder punches are made from a good grade of tool steel, hardened, and ground all over. They are readily available from a number of suppliers. Diameter *A* is a press fit in the punch plate.

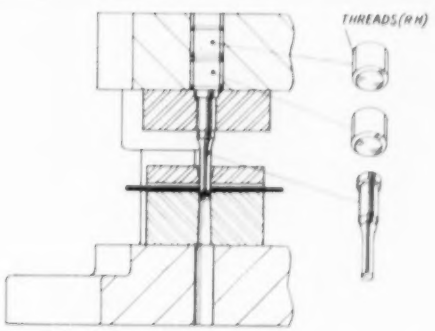
Diameter *B*, which extends at least 1/8 in., is a slip fit for good alignment while pressing. Shoulder *C* is usually made 1/8 in. larger than *A*. Shoulder height *D* is 1/8 to 3/16 in., depending on size. Piercing diameter *E* is always on the high side of tolerance



2 • • GUIDING IN THE STRIPPER. In first-class dies, small punches, under 3/16 in. in dia, are usually guided in a hardened bushing pressed into the stripper. Larger punches are often guided, particularly when cutting heavy stock, if there is a possibility of punch deflection upon contact with the strip. These guide bushings are hardened and ground on both inside and outside surfaces



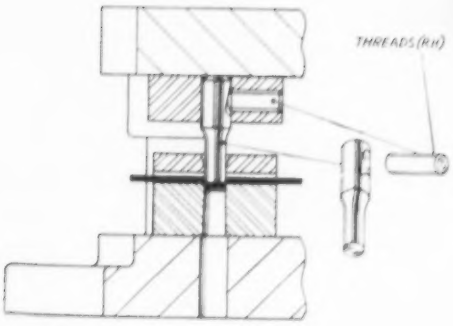
3 • • BACKING PLATES. When heavy stock is being pierced, the punch head is backed up by a backing plate, pressed into a counterbored hole in the punch holder. This plate prevents the punch head from sinking into the relatively soft dieset. Backing plates are made of tool steel, hardened and ground. The small hole through the dieset serves two purposes: (1) to accommodate the pilot on the counterbore, and (2) to allow the backing plate to be pressed out for die repair



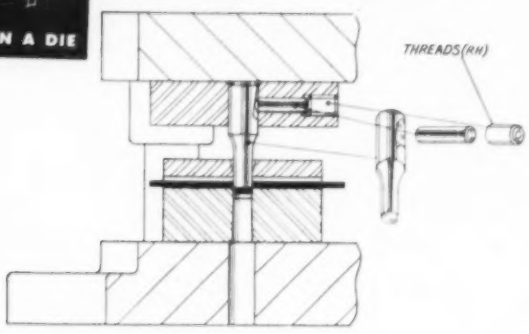
4 • • SETSCREWS BACK OF THE PUNCH. Two socket setscrews back up the piercing punch in this application. This method of retaining piercing punches permits a broken punch to be removed and a new one inserted without dismantling any part of the die. Make sure that the tap drill for the threaded hole is larger than the punch head. It is good practice to use National Fine threads for all die work to minimize loosening of screws under vibration

14 steps TO DESIGN A DIE

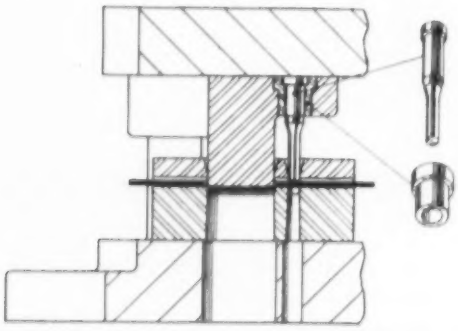
How to design piercing punches . . .



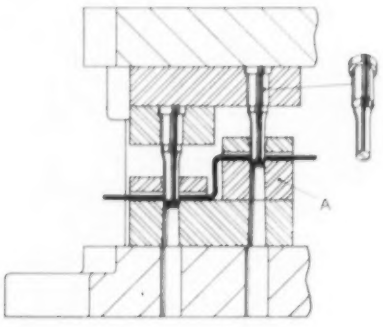
5 . . A SETSCREW HOLDS THE PUNCH. For short-run dies, where low accuracy requirements exist, this inexpensive type of punch may be used. It is made of drill rod machined to size at the cutting end. An angular flat is machined on the punch body for the point of the setscrew. However, the setscrew has a tendency to "throw over" the punch by the amount of the clearance. Therefore, this construction should never be used in Class A dies



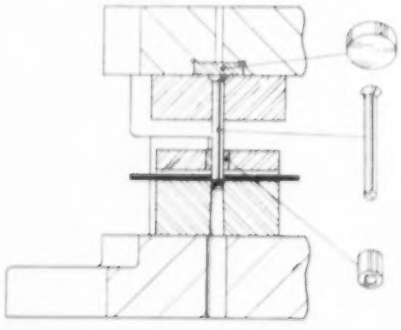
6 . . BRIDGING THE GAP. When the punch is located a greater distance from the punch-plate edge than standard setscrew lengths, a length of drill rod is used between the punch and the setscrew



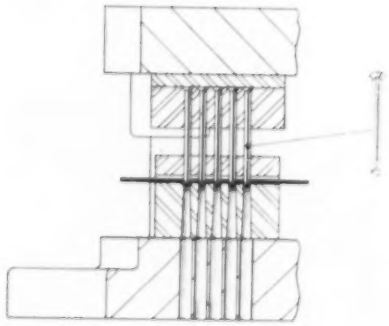
9 . . SOFT PLUGS AND HARD PLATES. When a small piercing punch is retained in the flange of a hardened blanking punch, a soft shouldered plug is pressed into the flange, then bored to retain the piercing punch. Modern practice may call for hardening only the cutting end of the blanking punch, leaving the flange soft. No bushing is then required



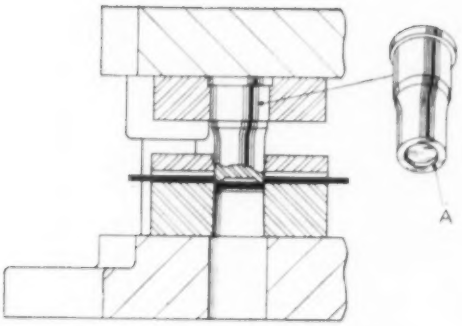
10 . . SPLIT-LEVEL PIERCING. To avoid excessively long piercing punches when punching stepped shapes, add an auxiliary die block as at *A*. In this manner, both punches can be made the same length for maximum strength and ease of construction



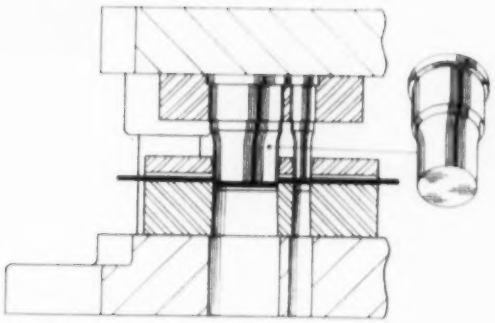
13 . . PEENING THE HEAD. It is difficult and expensive to machine shoulders on punches of very small diameter. For this reason they are made of drill rod, straight for their entire length. One end is peened to form a head and this is finished to a 82° included angle to fit standard countersunk holes. At assembly, the top of the punch plate is ground so the peened heads come flush with its surface. These punches should be invariably backed up by a hardenend plate and guided in the stripper



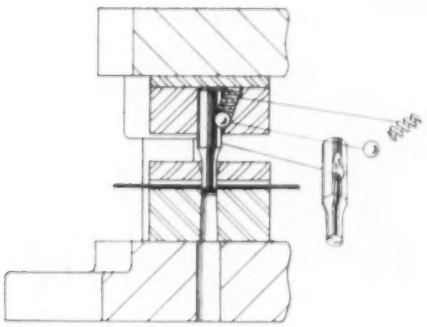
14 . . CLOSE PERFORATING. Tiny, peened-head punches are often arranged in great numbers at very close center distances. Such multiple units are backed up by one large hardened plate, and the punches are guided in holes in the stripper. They will pierce holes with diameters as small as twice stock thickness, if properly supported



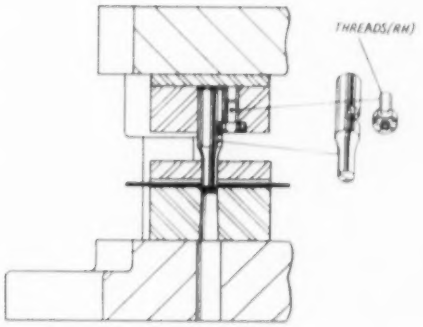
7 • • **LARGE PUNCHES.** Punches over 1¼ in. in dia are relieved at the center of the cutting face for ease of sharpening. When cutting heavy stock, the annular cutting ring *A* is often scalloped to relieve the shock on the press



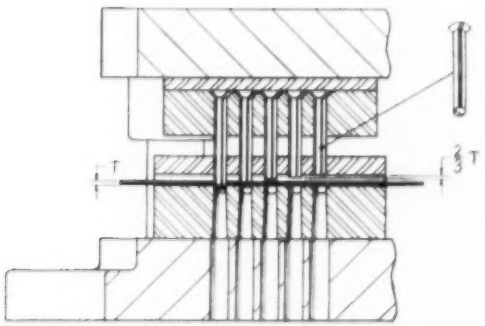
8 • • **STEPPING SMALL PUNCHES.** A small punch, adjacent to a large one, is made shorter by two-thirds of the stock thickness. Some material flow occurs as the large punch penetrates the strip. With both punches the same length the small one will deflect slightly, resulting in a nicked cutting edge and eventual breakage



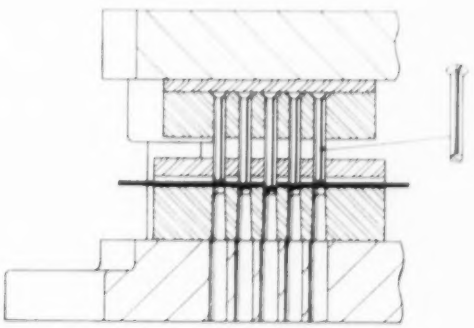
11 • • **RICHARD BROTHERS PUNCHES.** These standardized punches are held in their retainers, and also kept from turning, by spring-backed steel balls. A simple tool pushes up the ball, depressing the spring, for removal of the punch for sharpening or replacement



12 • • **HOVIS PUNCHES.** These standardized punches are held in their retainers, and also kept from turning, by special socket capscrews, the heads of which bear against grooves machined in the punches. The heads of the retaining screws have milled clearance radii so it is only necessary to give them a quarter turn for removal of the punches



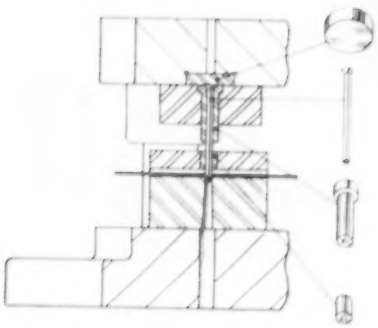
15 • • **STEPPED PERFORATORS.** Closely spaced, peened-head punches, when piercing thicker stock, should be staggered, so that not all punches enter the strip at once. This practice prevents excessive punch breakage due to crowding of the metal. Two-thirds of the thickness of the stock is generally allowed as an offset on punch length



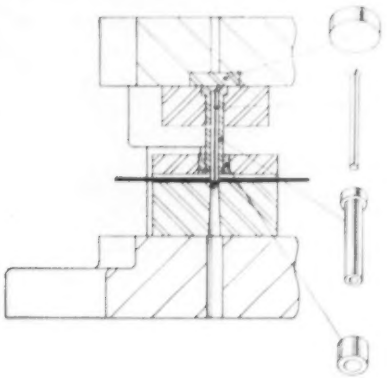
16 • • **ALTERNATE METHOD.** Here the central punch enters the material first. Succeeding punches at either side enter by steps. These, again, are made shorter by two-thirds of the thickness of the stock

14 steps TO DESIGN A DIE

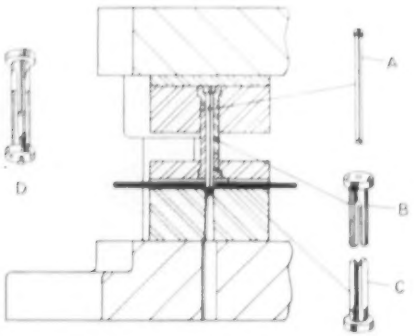
How to design piercing punches . . .



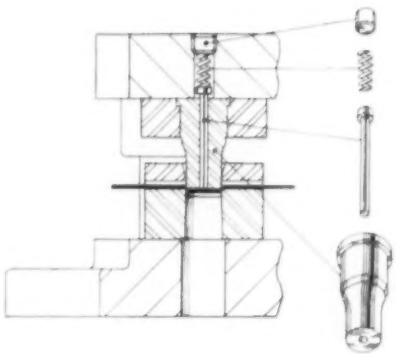
17 • • **QUILL SUPPORT.** Very small peened-head punches can be held in quills and guided in hardened bushings pressed into the stripper. When replacing the punches, simply remove them from their quills and insert new ones. These are backed up by either a hardened plate or socket setscrews



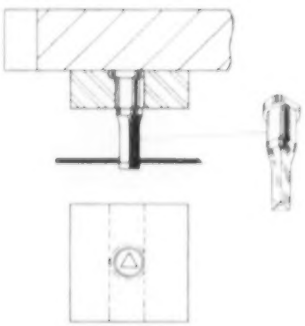
18 • • **GUIDING THE QUILL.** Another method of providing lateral support to a small, peened-head punch is to guide the quill in a hardened bushing in the punch plate. In this way the punch itself extends from the quill only a very short distance for stiffness



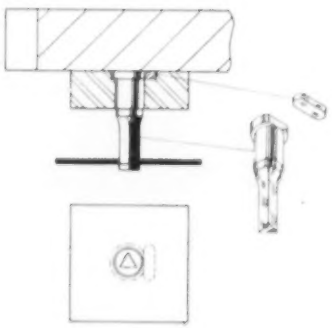
21 • • **DURABLE PUNCHES AND SLEEVES.** An ingenious method of supporting and guiding slender punches was originated by the Durable Punch & Die Co, which holds a patent. Headed punch *A* is guided and supported for its entire length in two intermeshing sleeves *B* and *C*. This construction allows piercing of extremely small holes, down to only one-half of the material thickness. A complete Durable assembly is shown at *D*



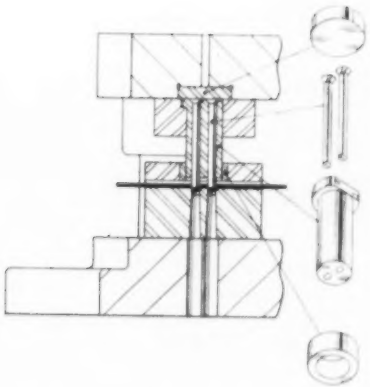
22 • • **SLUG HOLD-DOWN.** When piercing some thin materials, the slug tends to follow the piercing punch out of the die hole. This can be a serious problem in progressive dies. To overcome the trouble, incorporate a stripper pin in the punch. This headed pin is backed up by a spring and setscrew



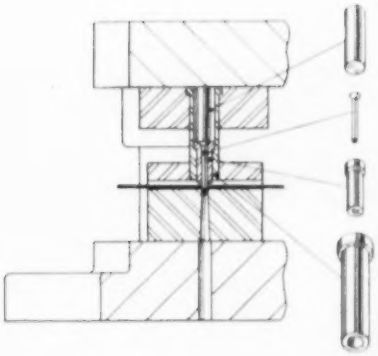
25 • • **IRREGULAR PUNCHES.** A good method of keeping irregular punches from turning is to machine a flat in the punch head. This flat bears against one edge of a slot machined in the punch plate. A snug fit is required



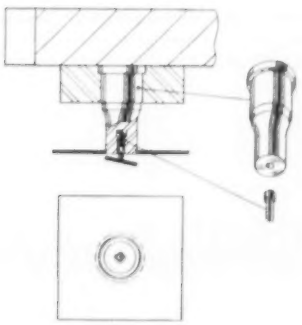
26 • • **RETAINING KEY.** Another good method of keeping an irregular punch from turning is to machine a flat in the punch head, as before, and insert a small round-end key in a slot end-milled in the punch plate. This method is particularly useful in multiple-station progressive dies where space is limited



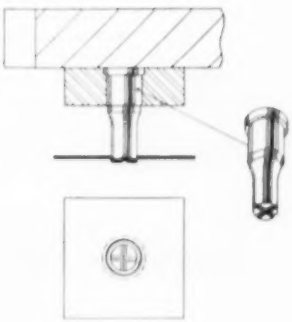
19 • • **ONE QUILL — TWO PERFORATORS.** Two or more closely spaced peened-head punches can be held in a single quill. The quill is kept from turning by a flat machined on one side of its head. This flat bears against one edge of a slot machined in the punch plate



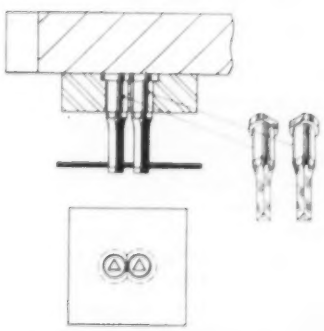
20 • • **BIT PUNCHES.** Tiny bit punches, made of top-grade material, are held in a small quill, backed up by a hardened plug. These components are, in turn, held in a larger quill. In this way the punches can be made of expensive material, but the cost compares favorably with larger punches made of lower-grade steel



23 • • **RUBBER BUMPER.** Another method of preventing slugs from pulling up out of the die hole is to insert a rubber bumper in a recessed hole in the punch. The rubber bumper is made with a head to keep it from falling out in operation



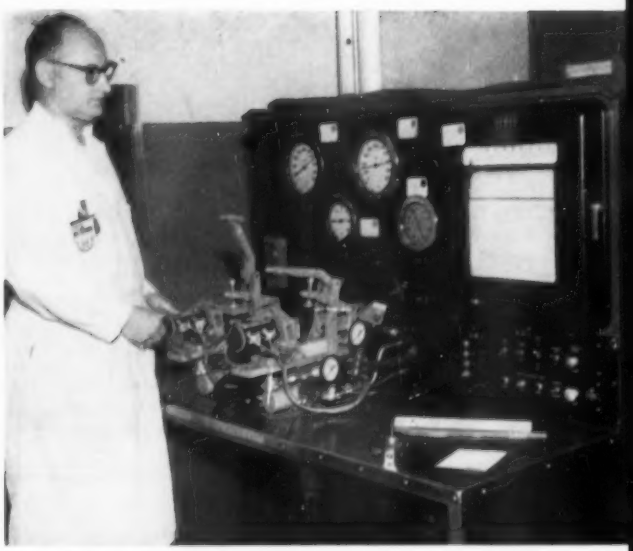
24 • • **TEMPORARY SOLUTION.** If slugs are pulling up at the die tryout stage, grind two slots in the cutting face of the punch as shown. This is a temporary measure; push-off pins should be applied later



27 • • **MATING FLATS.** Where irregular punches are close together, an excellent method of keeping them from turning is to machine flats on both punch heads. These flats bear against each other with a good fit, keeping the punches in alignment

28 • • **DOWELED PUNCH HEAD.** If a large head is left on an irregular piercing punch, a small dowel, pressed through both the head and the punch plate, will keep the punch in good alignment. This is not as good a method as those previously described, but is used frequently for low- and medium-production dies

THREAD GRINDER is used to finish faces on servo-valve spools to ±0.000010 of correct spacing. Machine was WWII vintage, was rebuilt to precise tolerances and equipped with special feed, gaging, and wheel-dressing mechanisms. Parts are ground between special dead centers; dimensions, or amounts of metal to be removed, are given on a card prepared by the Inspector. Card is prepared for each piece and metal removal is specified for each face to insure proper function of the valve in use



HYDRAULIC GAGE BENCH checks motion of servo-valve spool relative to hydraulic flow and mechanically traces physical dimensions of spool on graphic chart. From this chart, required stock removal is determined

Special tooling converts thread grinder for

Tight design specs and tight development budgets frequently add up to tough manufacturing problems. Smart tooling is one solution. Here, a problem was solved by using the inherent accuracy of a machine built for one job to meet similar characteristics in another job

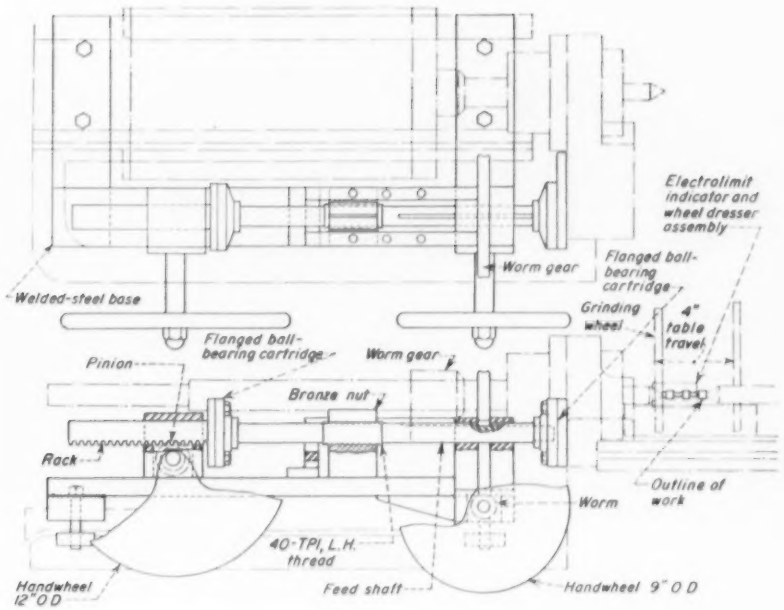
Precision finishing of faces on servo valve-spools is essential to insure accurate control of hydraulic aircraft actuators and similar control mechanisms. Distances between the faces must be held within 0.000020 in., or less, and the faces must be parallel within the same tolerance, for the valves to function with the required accuracy. In addition, a radius on the corner of each face must be less than 0.0001 in.

When developing the servo valves we tried unsuccessfully to economically finish the valve faces using conventional toolroom equipment — then we decided to rebuild a grinder, especially for these operations. Budget limitations would not permit purchase of a special precision grinder until production requirements justified it.

One of the machines available from the stock of tools inherited from WW-II days was a well-worn Ex-Cell-O thread grinder. It had a ball-bearing supported table and the inherent accuracy required for grinding precision threads.

This machine was put in first-class condition; table-support balls were replaced with a set of specially selected precision balls, and a grinding-wheel spindle with zero endplay was installed. In addition, the machine was converted to support the workpieces between dead centers, with a separate mechanism to rotate the parts, and Bell's tool design dept designed and made a special worm-feed mechanism geared so one revolution of the feed handwheel would traverse the part longitudinally only 0.0004 in. This unit is mounted on the front of the machine bed, and has a rack-and-pinion rapid traverse for quick rough positioning of the workpiece in line with the grinding wheel.

Considerable testing was necessary to determine the correct wheel to use for this ultra-close tolerance job. Finally, we settled for an A320-J grit, medium-grade, wheel. The wheel is dressed with a novel three-diamond dresser which dresses the two side faces and the periphery of the wheel by traversing the wheel past the fixed-position dresser. The dresser slide is mounted on the machine bed, under the gage support, and is withdrawn to clear the wheel when parts are to be ground.



SPECIAL FIXTURE contains handwheel-controlled worm which turns threaded feed shaft in nut between two flanged, ball-bearing, cartridges to feed grinder table 0.0004 ipr for precise feed of spool against grinding wheel. Separate rack and pinion moves table for rapid traverse. Shaft is hardened to R_c 53-58

facing to 0.000010 in.

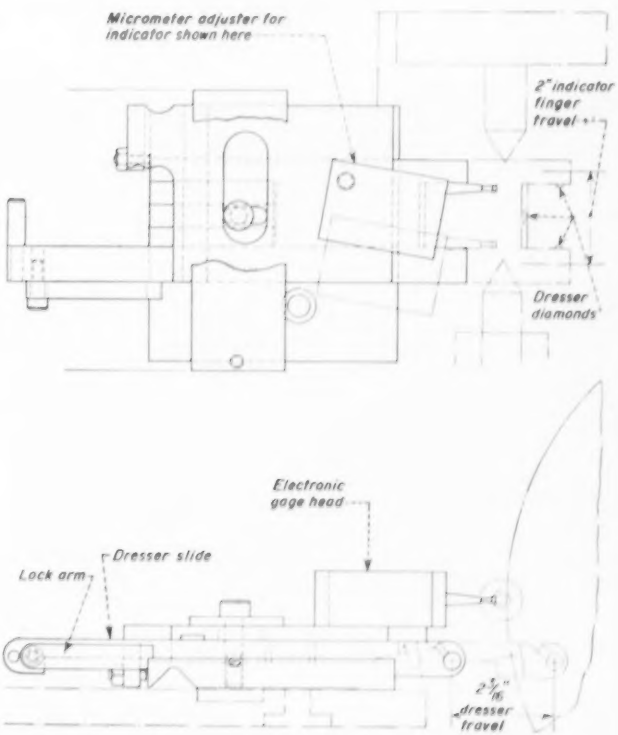
ROY E. UDD, general foreman, Precision Valve Shop
BELL AIRCRAFT CORPORATION, BUFFALO, NY

Accurate gaging of the workpiece *during grinding* was difficult. By using an electronic gagehead from a Pratt & Whitney Electrolimit height gage, and equipping it with a carbide-tipped indicator finger to contact the face of the workpiece during grinding, we eliminated trouble with backlash in the feed mechanism and achieved the desired results.

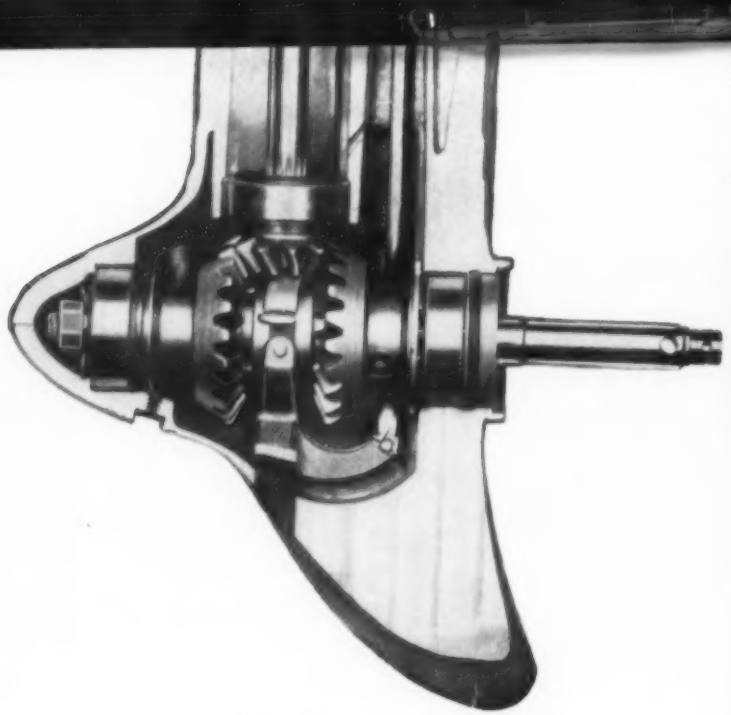
The gage scale had to be set so increments on the scale read directly the amount of stock actually removed. This was checked with gage blocks and a precision hydraulic-flow gage; finally, it was possible to set the gage components to read part size directly within 0.000010 in.

In use a little more than two years, the machine has been used to finish thousands of servo valve spools for experimental projects and for production valves. It still is in use, though most spools for production valves now are finished in a new, specially designed, spool grinder.

Meanwhile, we solved our problem of limited budget, proved operational feasibility, and learned some new tooling tricks for solving future problems.



ELECTRONIC GAGE HEAD and three-diamond wheel dresser are mounted on machine bed in front of wheel for maximum accuracy. New wheel is 14 in. dia; is used down to 12½ in. dia. Gage head is mounted in a special micrometer-adjustable holder (not shown) for precise setting



Tight tolerances here . . .

Three hypoid spiral-bevel gears that drive props in *Sea-Horse* outboard motors are made of top-quality steel, closely controlled to eliminate whine at top speeds

- **CLOSE CONTROL,**
- **TIGHT TOLERANCES,**

Quiet bevels in "Sea-Horse"

Materials and methods must work together to insure quiet operation of gearing in such demanding service as that an outboard motor is expected to provide. At Johnson Motors, *quiet* power is stressed beginning with gear design. Bevel gears with 15-to-35° spiral angles are used in 5½-, 7½-, and 10-hp models, and gears in the 15- and 30-hp models have a modified spiral of 15°. All drive gears and pinions are of SAE 4615 fine (7 to 9) grain, cold-drawn, magnetic-tested steel bars with an average hardness of 180 to 210 Bhn.

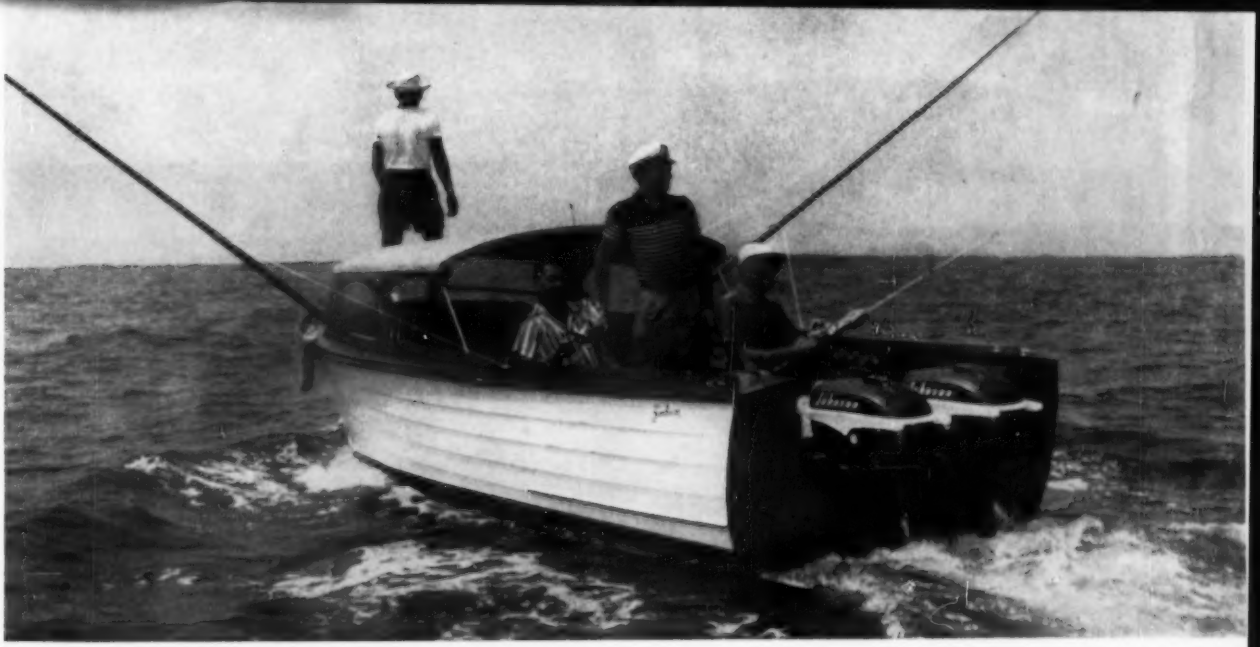
Because no gear can be more accurate than the blank from which it is cut, particular attention is given to metallurgical control of the material and to finishing operations which prepare blanks for tooth-cutting and heat-treating. The Johnson metallurgical laboratory periodically checks incoming bar stock. It also makes daily checks of heat-treating salt baths, and of core and case hardness as well as case depth on gears sectioned after hardening, drawing, and shotblasting. For long service life, hardness of the finished gears is held to 59 to 61 R_c.

Blanks are machined in 6-spindle Conomatics. Precision boring, facing, and chamfering are performed in Heald and Ex-Cell-O machines. Blank bores are held within 0.0005 in., rear faces square with bore to 0.0001 tir, and distance from the thrust face at rear to the rough-bevel face within 0.002 in. Carbide bits are used on larger blanks; smaller blanks are machined with cemented-carbide boring bars for rigidity.

After gear generation (a Gleason No. 106 machine does the larger sizes, a Gleason No. 7A the smaller), gears and pinions are heat-treated by carburizing and hardening in a two-cycle procedure using Ajax-Hultgren electric salt bath furnaces with Aerocarb-E water-soluble carburizing compound containing approximately 16% cyanide. For these operations, the gears, grouped in equal lots, are suspended on Inconel hangers from rods placed across the tops of the furnace pots. Automatic timers with signal lights control the cycle at each furnace pot. Because cyanide is used, the furnaces are hooded and ventilated with oversize blowers.

Gears are carburized by heating to 1675F for 2 to 2½ hr, depending on size, suspended for approximately 15 min for air cooling to 400F or less, then immersed in second pots for reheating to 1525F for 20 min. They then are quenched in oil maintained at 90 to 110F by constant agitation and circulation through a heat-exchanger. Quenched hanger loads are hung on rods over the oil tank, to drain off drag-out oil.

Drained gears are next dipped in a tank of hot water with No. 245 Houghto-Clean solvent and are held at 180 to 190F by thermostatic controls for 20 min or more to remove all traces of quenching oil and adhering cyanide salts. Cleaned gears, still on



. . . *Mean quiet power here*

Discriminating users want real quiet in an outboard, even at prop speeds of 4000 and 5000 rpm for long periods. That means each of 100,000 gears a month must be as exact as if individually made

drive

R. E. MEDEEN, master mechanic, and LEONARD PRESSNELL, foreman, Gear Dept.
JOHNSON MOTORS, WAUKEGAN, ILLINOIS

hangers, are now dipped in a tank of 180-to-190F clear rinse water, then hung on overhead rods to dry. One gear from each rack is checked for hardness, which must be close to 64 Rc.

Finally, gears are stress-relieved by heating to 325F for 1½ hr in a Leeds & Northrup Homo-Draw pot furnace, then air-cooled for 20 to 30 min before shotblasting in a Tumblast machine containing steel shot. Finished gears again are checked for hardness —usually on a 10% quality-control basis—which must be between 59 and 61 Rc.

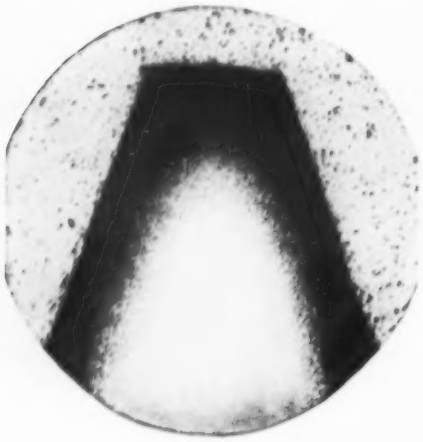
Hardened gears are honed in the bores, finished by grinding where necessary, and polished on thrust faces by hand lapping against sheets of 240-grit aluminum-oxide cloth to remove possible burrs. Finish on thrust faces must be 10 mu-in. or better. Bronze liners are pressed in forward gears, which are then held in Garrison chucks for boring in Heald 2-spindle Bore-Matics. After a 100% visual inspection, finished gears are delivered to storerooms until needed for gear-case subassemblies.

Largest gears are 2.812 in. OD for the 30-hp model. Drive pinions on 10-, 15-, and 30-hp models operate at 4000 to 5000 rpm, those on the 5½ and 7½ models at 3500 to 4000. Reduction ratios are 12:21 for the two large models, 15:26 for the three smaller ones. A non-reversible 2-gear drive in a 3-hp *Sea-Horse* has 17:28 reduction and runs at 3500 to 4500 rpm.

SPIRAL-BEVEL GEARS and pinions are tested against masters on a 10% quality-control basis with Gleason gear testers. Most gears have teeth cut with 20° PA, 15 to 35° spiral. Tooth form is held so accurately in cutting and heat-treating that grinding of tooth profiles is unnecessary

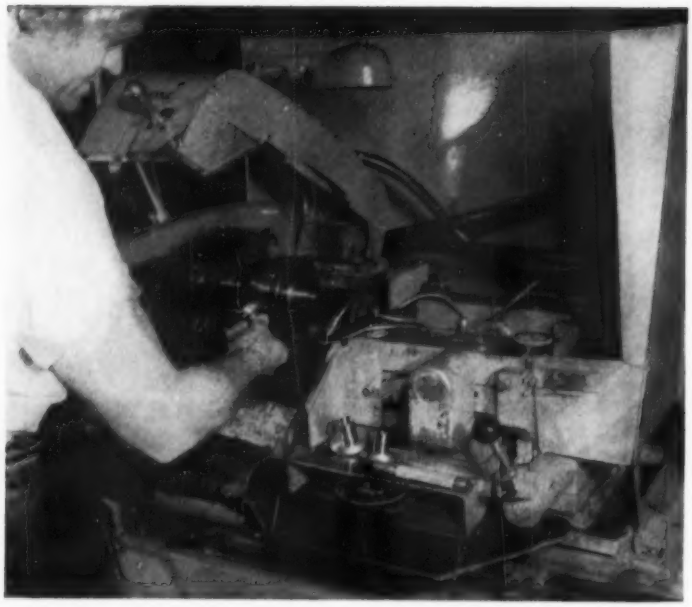
CONTINUED IN PICTURES . . . ▶

quiet bevels in "Sea-Horse" drive . . .



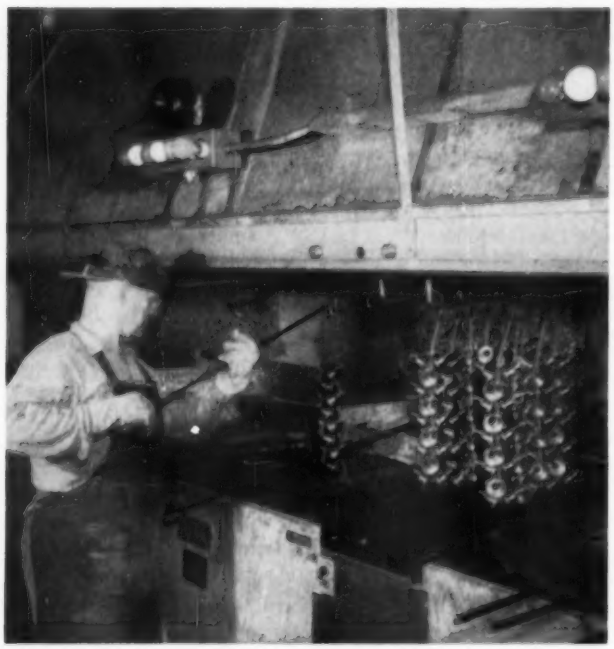
HARDENED CARBURIZED CASE on tooth surfaces of drive gears averages 0.021 in., as shown on this 35X photomicrograph. This is a vertical section through tooth, polished, then etched with ammonium persulfate

HOW QUIET GEARS ARE MADE



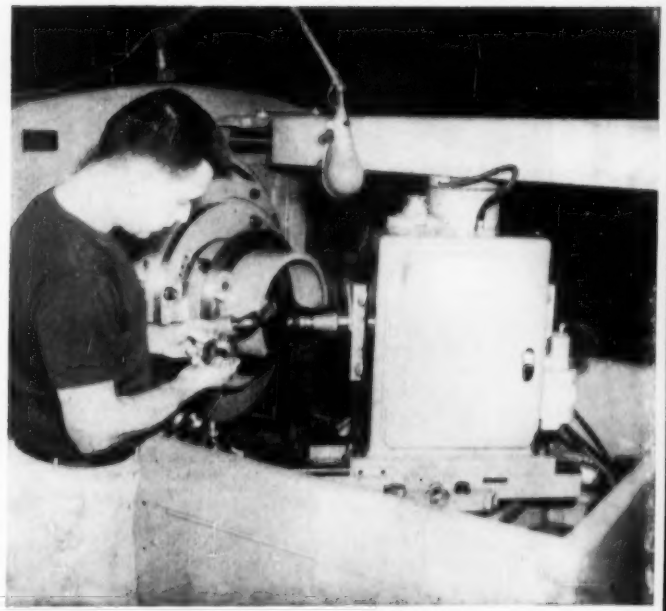
1 KEY OPERATION is finish-boring and facing of blanks in Heald 2-spindle 48-A Bore-Matic. Blanks are located on bevel face against three hardened pads in each chuck. Distance from rough-bevel face to rear face of gear must be held within 0.002 in., bore within 0.0005 in.

4 SMALLER GEARS and all pinions are cut in Gleason No. 7A spiral-bevel generators. Specs are so close that vibration meters have been used occasionally to locate and correct cutter inaccuracy. tooth form is corrected for heat-treat growth



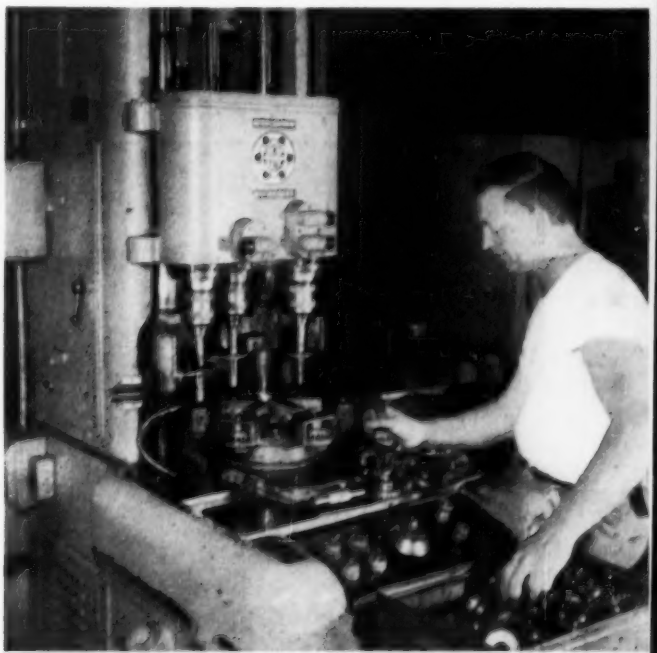
5 SIGNAL LIGHTS above Ajax-Hultgren electric salt-bath furnace tell operator when specific heating cycle for each load of gears has ben completed

2 **FOUR-SPINDLE GORTON MILL** cuts clutch dogs in faces of gear blanks, using two spindles in alternate cycles. HSS end mills cut blanks at approx 150 pieces per hour. Depth of cut must be held within 0.003 in. from face of gear blank



3 **DRIVE AND REVERSE GEARS** for 30-hp outboards are cut in recently developed Gleason No. 106 hypoid spiral-bevel-gear generator, using automatic roughing and finishing cycle. Blank moves in to cutter 0.020 in. automatically for finishing cuts

6 **BLASTING** with steel shot for approx 20 min in Wheelabrator Tumblast barrel cleans all scale from gears and pinions, breaks away any remaining burrs on tooth profiles. These burrs are so brittle, because of heat-treatment cycle, they snap off easily



7 **PROPELLER DRIVE GEARS** are finished by honing bores to within 0.0005 in. in Micromatic Hydrohoner equipped with Microsize controls on each spindle. Production averages 150 to 200 per hour

PLEASE TURN PAGE ▶

quiet bevels in "Sea-Horse" drive . . .

8 **SPLINED BORES** of drive pinions are finished by honing on Sunnen machine, at rate averaging 125 per hr per machine. Operation insures easy fit of pinion on end of vertical drive shaft

9 **FOR SOME 'SEA-HORSE' OUTBOARDS,** gears and pinions must be finish-ground on shanks in Norton angle-head grinder equipped with Foster Electrosize automatic gage. Tolerances are 0.00025 in. on OD and back face of gear. Finish must be under 10 mu-in. rms

10 **SUBASSEMBLY** of drive shafts, pinions, gears, and propeller shafts in gear boxes is done in wood fixtures at workbenches

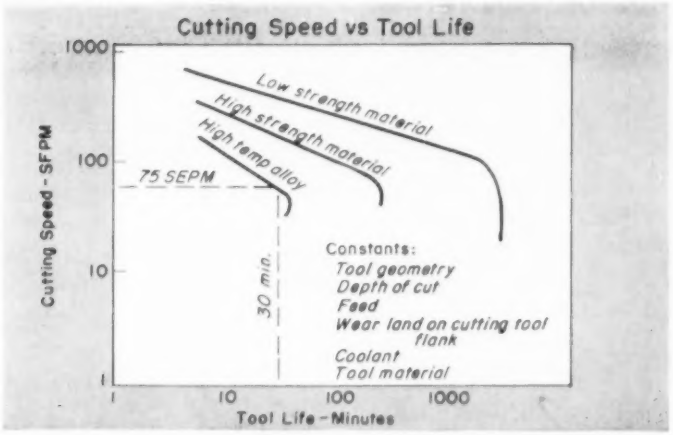


FIG. 1 . . Speed vs tool life curves

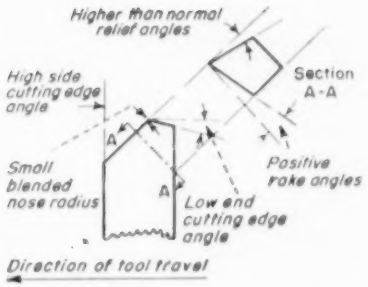


FIG. 2 . . Tool geometry for machining superalloys

How to machine superalloys

Difficult, yes, but following the basic principles outlined here will prove that it is not impossible

R D HALVERSTADT, Jet Engine Department, GENERAL ELECTRIC CO. CINCINNATI

High temperature means low machinability. This is true, but most of the high-temperature alloys can be machined if certain special techniques are followed. There is no magic or "hocus-pocus" in these techniques—they are all based on common sense and a thorough basic knowledge of the "do's" and "why's" of machinability. Once these factors are known the reasoning can be applied to machining almost any material.

MACHINABILITY DATA

The average machinist or process planner is afraid of any suspicious looking curves and graphs because he feels that they belong to the "ivory tower" theorists. He is preconvinced that he does not understand them. Nonsense! Any machinist who knows how to read even simple drawings can use machinability data.

The best form for machinability data is a plot of speed *vs* tool life from actual tests conducted on the alloys in question. This is especially necessary on the high-temperature alloys because the usable practical range of speeds is usually critical. Cutting speed is used as the ordinate because it has the greatest single effect on tool life. The other variables such as feed, depth of cut, geometry, and cutting fluids can be superimposed on this same chart. Usually, however, good results can be achieved with the speed-tool life relationship alone. (Fig. 1)

It is a convenient fact that over a certain range the speed-tool life relationship is a straight line if the data is plotted on a logarithmic scale. This relationship is known as "Taylor's Law" and was first discovered by F W Taylor, who has been known as the "Father of Modern Production Methods". It is not important to know Taylor's law except to state that machinability data will not be a straight line on ordinary coordinate paper and, therefore, are much easier to use and understand if a logarithmic scale is used.

To use machinability data it is first necessary to select a desired tool life, say 30 minutes, as in Fig. 1. If the material in question was the low-strength alloy, this would correspond to 300 sfpm cutting speed. Conversely, the cutting speed could first be selected and the resulting tool life could be found. Note that this is for one set of constant conditions. Changes would occur if different conditions were used. If sufficient data are available, the effect of a change in conditions can be evaluated. If not, a good knowledge of the principles will allow estimates to be made which are usually sufficiently close.

Notice how the slope of the line varies. Practically, this means that as we go into the more difficult-to-machine materials the effect of a change in speed becomes more pronounced. On the high-temperature alloys a small increase in speed may cause a large decrease in tool life. Remember, that all data

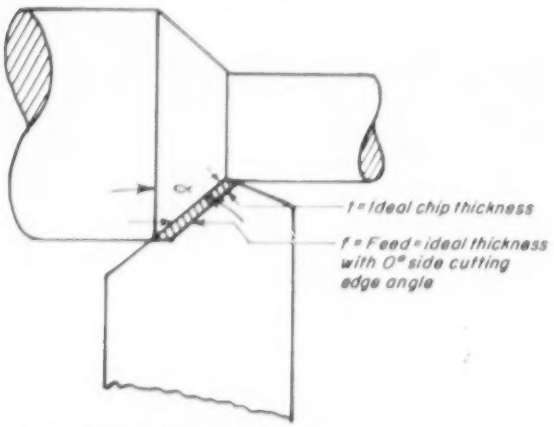


FIG. 3 . . High side cutting edge angle distributes load

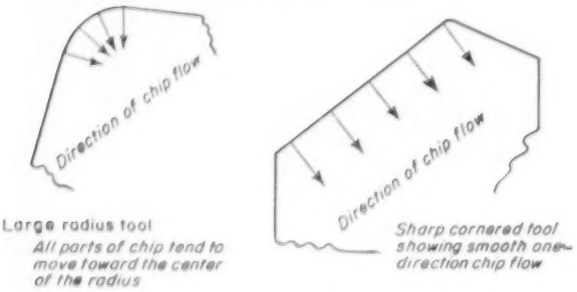

Direction of chip flow
Direction of chip flow
Large radius tool
All parts of chip tend to move toward the center of the radius
Sharp cornered tool showing smooth one-direction chip flow

FIG. 4 . . Large radius causes crowding of the chip

in Fig. 1 are general and are shown only for demonstration purposes.

The next important thing to note is the "fall back" of the curve as the tool life is increased by lowering the speed. Many authorities state that this is true of almost any material and cutting-tool combination, but happens on conventional materials at such low speeds and long tool life that it is not usually discovered.

On high-temperature alloys this occurs at fairly high speeds and low tool life and results in very narrow practical operating ranges. Thus, with the alloy shown in Fig. 1 this "fall-off" begins at about 30 minutes or 75 sfpm. It would, therefore, be impractical to operate at a speed very much below 75 sfpm. The tool life above 150 sfpm is so low that it becomes an impractical operating condition. Therefore, we are restricted to operating in the narrow range of 75 to 150 sfpm. This range is representative of the high-temperature alloys and will be wider or narrower depending on the particular set of conditions.

The cause of this "fall-off" is complicated and not completely understood but is caused by such things as changes in rate of strain as the chip is formed. The end result is higher unit forces in the tool which are complicated by cyclic occurrences which cause *chipping* and *fracture* of the cutting edge. This results in a departure from the straight-line relationship because the tool wear is no longer the result of abrasion but is the result of chipping and fracture.

The important thing to learn is that the operating range is narrow for the high-temperature alloys. The use of reliable data is essential so that practical conditions are used at the start of a new and untried machining operation. Procure, understand, and use machinability data.

TOOL GEOMETRY

Almost blanket recommendations can be given on tool geometry to be used on high-temperature alloys. (Fig. 2):

High side cutting edge angle

Low end cutting edge angle

Use a sharp corner on nose broken only by a small radius of 0.010 to 0.020 in.

Higher than normal relief angles

Positive rake angles

The reasons why these geometry principles are desirable have been given in many textbooks and publications and only the important considerations will be discussed.

Side cutting edge angle—A high side cutting edge angle distributes the chip load over a large area of the cutting edge. For any one depth of cut and feed the volume per revolution will always be the same, but the high side cutting edge angle allows more of the cutting edge to work as shown in Fig. 3.

It is easily shown that $t = f\cos x$. Thus, the closer the angle approaches 90° the thinner the chip will be. This distribution of work means lower forces on the tool and work. The additional length of tool contact also permits greater heat-transfer area tending to reduce the tool temperature. The lower forces and temperature alone would permit longer tool life at any one set of conditions. A secondary effect is that this inhibits the formation of a built-up-edge which has a widely known undesirable effect on finish and will tend to cause chipping when it flakes off from the tool's cutting edge. Also the lower forces tend to reduce the amount of strain or work hardening which takes place.

End cutting edge angle—The low end cutting angle helps to promote a good finish by virtue of the increased point angle which is in contact with the work. More important, however, is the obtuse angle formed on the tool point. This produces a strong tool point without the use of a large radius which is also an important consideration.

Nose radius—The use of a large radius is particularly undesirable because all parts of the chip tend to move toward the center of the radius as shown in Fig. 4. This crowding or balling of the chip tends to inhibit smooth, even chip flow. This covers higher forces and greater plastic deformations which again results in a greater degree of strain hardening. The straight cutting edge allows a smooth, even unidirectional flow of the chip which is easily broken and handled.

Relief angle—The use of higher than normal relief angle tends to present a sharper cutting edge to the work which in itself tends to lower the forces.

However, a more important consideration is the effect of relief angle on the flank wear land on the tool. The higher relief angles permit more wearing time or tip wear for any given wear land as shown in Fig. 5.

Wear land—The use of small wear land is extremely important. A large wear land tends to increase forces and to generate more frictional heat. Thus, the tool is weakened at the same time it is required to withstand higher cutting forces. In many of the high-temperature alloys sudden and total failure will result after a certain relatively small wear land is reached. Also, a tool with a large wear land will cause more residual stress to be imparted to the workpiece. This, in many cases, causes dimensional control to be impossible. The use of small wear land (0.010 to 0.015 in.) is highly important.

Rake angle—The rake angle is also an important agent for reducing cutting forces. It is, therefore, necessary to use positive rake angles as large as possible. However, a rake angle that is too large will cause the cutting edge to be too weak to withstand the forces. It is important then to design a balanced process where the relief and rake-angle combination produces a tool strong enough to withstand the cutting force of the particular feed and type-of-cut combinations. Thus, different feeds and geometries might call for different optimum rake and relief-angle combinations. Find the right combination for your job.

Negative rake tools—In general, negative rake tools of the modern "throw-away" insert type have not lent themselves to cutting high-temperature alloys. However, these tools have worked extremely well on some alloys by adding a chip curler which in effect produces the effect of a high rake angle. This geometry has succeeded in reducing the cutting forces and the subsequent strain-hardening effects. The geometry is not a "cure all" but has given good results on certain of the high-temperature alloys. The chip curler is ground in with a small diameter diamond wheel. A definite relationship must be worked out which combines wheel diameter, depth, and width of curler to give the correct geometry for each material.

SELECTING TOOL GRADE

The correct selection of tool grade is perhaps the easiest but one of the most important points to achieve. Many studies of recent origin have shown that tool wear is due in part to the solid solution chemical effects between tool and work. It is logical that this would be true since the cutting process inherently takes place with extremely high local temperatures and pressures. Thus, it has been found that different grades perform vastly different on different materials. In general, it might be stated that if the high-temperature alloys have a large percentage of iron, the carbides containing tungsten, tantalum, and titanium will be superior. For the alloys with little or no iron, the pure tungsten carbides are usually

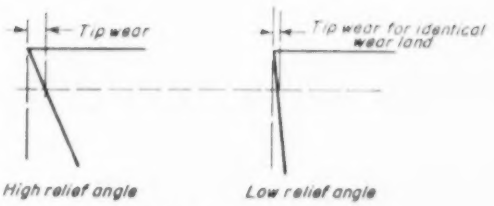


FIG. 5 . . High relief angles permit more tip wear

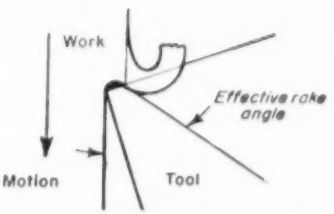


FIG. 6 . . Chip curler increases effective rake angle

the best. However, there are exceptions to the rule.

If an alloy is encountered which tends to have an extremely narrow operating range with carbide tools, it is usually better to go to high-speed steel as a cutting medium. High-speed steel does not chip as easily and especially for cutting operations with impact is often more satisfactory.

CORRECT CUTTING FLUID

There are many times that a cutting fluid will help in machining the high-temperature alloys. One of the big problems is the built-up edge. This edge can be reduced in many cases by the use of a good sulfurated oil. Tool-tip temperatures are extremely high when machining high-temperature alloys. Therefore, care must be taken not to quench a hot tool with coolant. It is necesary to shut-off the coolant supply before the tool is removed from the work. If this is not done, immediate and total tool failure will result. For the same reasons conventional coolants have not been used during carbide milling of the high-temperature alloys. The carbide milling picture has been considerably broadened by the use of air-oil-mist coolants which lubricate without quenching.

The alloys are difficult to machine because:

1. They are generally more abrasive than ordinary materials. This fact tends to increase the slope of the machinability curve and in general to decrease tool life.

2. They are extremely vulnerable to strain hardening and, therefore, recutting over a previously machined surface should be avoided as much as possible.

3. The cutting forces are extremely high. For instance, the cutting force for the standard 7° negative rake insert tool in A-286 is 530,000 psi.

4. The cutting temperatures are extremely high.

Despite these conditions, the alloys can be machined if you understand the effects of tool geometry and coolants, and understand how to obtain and use reliable machinability data.

Soviets claim new cutting-tool geometry eliminates vibration . . . multiplies tool life 80 to 200 times

Soviet research engineers offer results of their program to eliminate chatter during turning, and a second program for better tool life. Results of tool geometry to produce self-generated vibrations are analyzed, as well as the solution to this problem by grinding a damping flat. A final report from another Russian source tells how an unsual top rake considerably improves tool life.

Digested and interpreted from an article by
M I KLUSHIN and D I RYZHKOV
in VESTNIK MASHINOSTROENIYA

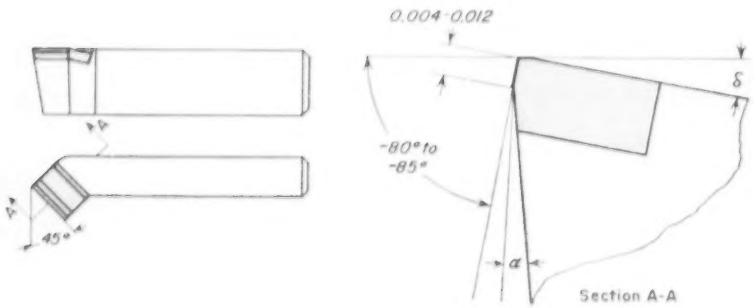


Fig 1 . . Negative flat of from −5° to −10° (−80° to −85° from horizontal plane) on the front cutting edge of toolbits provides them with an anti-chatter performance. Flat is from 0.004 to 0.012 in. wide and runs along the entire length of cutting edge. Anti-chatter effect from the toolbit is intensified in several ways: by increasing width of flat, by increasing the length of the top rake, and by decreasing top rake angle. It is significant to note that the Russians have standardized the various cutting angles of toolbits using delta for top rake, alpha for front rake, etc

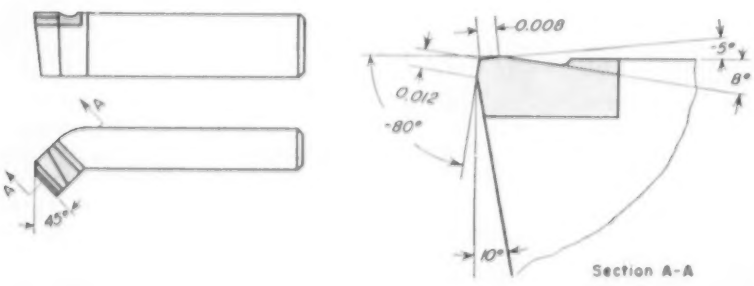


Fig 2 . . Machining steels, where the depth of cut is greater than 0.040 in., and when using a cutting-tool geometry as shown above, the width of flat on front clearance angle should run between 0.008 to 0.012 in. When depth of cut is less than 0.040 in., width of flat on top rake, and on the front rake is held between 0.008 to 0.012 in.

Chatter of low frequency during turning can be eliminated by grinding a flat with a negative rake at the cutting edge of the front clearance angle. Vibrations were either eliminated or considerably damped. The anti-chatter flat provided on the toolbit (Fig 1) proved successful on turning, boring, thread cutting and parting tools.

Data compiled from numerous Russian tests, using the anti-chatter toolbit, Fig. 1, indicate that the width of the flat (on the front-clearance angle) varies when machining different materials. Here are the claims:

1. Medium - and high - strength structural and tool steels — flat width 0.004 to 0.012 in., top rake 0° to 20°.
2. Low-carbon steels — flat width 0.004 to 0.012 in., top rake 20° to 25°.
3. Low - rigidity parts - turning, drilling, boring — flat width 0.004 to 0.012 in., top rake 25° to 35°.
4. Chatter is considerably damped when machining steel where the depth of cut is over 0.040 in. and when using a tool geometry, as shown in Fig 2, with a flat 0.003 to 0.012 in. wide on the front cutting edge only.

5. When the depth of cut is less than 0.040 in., chatter is eliminated when a flat 0.008 to 0.012 in. wide is provided on both the front clearance angle and top rake.

Time between regrinds was calculated for an anti-chatter turning tool using a mechanically held carbide tip (15% Ti, 6% Co, 79%W) Fig 3. This tool was ground with a double angle on top rake, ie, a top rake of 15° and a flat 0.040 in. wide, 0° at the cutting edge. Front clearance angle α, was 10°, nose radius 0.020 in., side cutting angle and end cutting-edge angle 45°.

Tests were conducted by machining medium carbon steel at 528 fpm, with 0.040-in. depth of cut and feed of 0.008 ipr. Results showed that widths of flats up to 0.008 in. wide with a front clearance angle of 10° did not reduce time between regrinds. Secondly, using the same front clearance angle and a flat 0.012 in. wide, time between regrinds was reduced. Finally, by adding the anti-chatter flat to the front clearance angle, chipping of the cutting edge was considerably reduced and tool life increased because of the stronger cutting edge and a permissible increase of the side clearance angle.

Method of producing the flats on tools was either by hand lapping, stoning or by means of a cast-iron disk coated with a paste of boron carbide. When hand lapping, best results can be obtained by using the special jig shown in Fig. 4.

Further machining experiments were conducted with the anti-chatter toolbits to determine the relationship between the forces Px, Py, and Pz, the speed of machining for various combinations of values for the flat; and the top rake. The same grade of carbide was used, and the material machined was a medium-chrome steel. Cutting forces were measured on a three-component mechanical dynamometer while turning with the toolbit shown in Fig 5. Values for Py are not shown on the graphs because they were analogous to Px.

Five series of tests were made. In the first series, the effect of cutting force on speed was determined for machining with toolbits without a flat. This test was conducted to serve as a basis of comparison for toolbits with various flats in subsequent tests.

In the second series of tests, the influence of length of flat was investigated at constant values of $\delta\phi = 80°$ and $\delta_{2p} = 0°$. Values of ϕ_1 varied from 0.008, 0.016, and 0.020 in.

In the third series of tests, the influence of top rake, δ_{2p}, was investigated. Constant values were maintained for the following dimensions:
flat $\delta\phi = -80°$, vertical height of flat $\phi_1 = 0.018$ in., and top rake angle was first tried at 0°, then at 15°.

The fourth series of tests was conducted on the influence of the negative angle $\delta\phi$, of the flat. Constant values were used for ϕ_1 of 0.016 in. and δ_{2p} was 0°. Values of the negative rake were −70° and −80°. Curve 2 shows results obtained when $\delta\phi$ was −90° and ϕ_1 equal to 0.040 in.

Because wear of the bit may

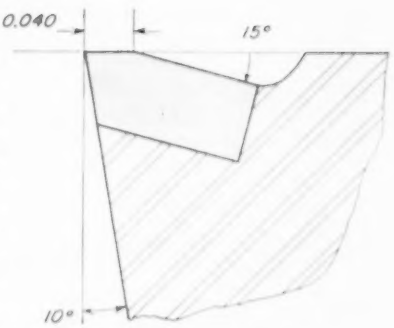


Fig 3.. Geometry of toolbits used in conducting tests to determine time between regrinds is shown above. In the final test, a flat 0.012 in. wide was added to the front clearance angle, as shown in Fig 1.

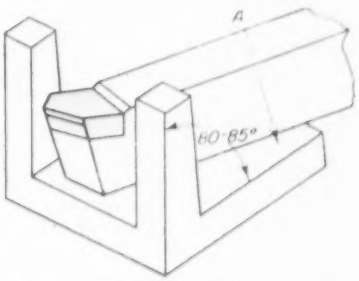


Fig 4.. Hand lapping jig recommended for producing flats on toolbits. Surface A is an auxiliary plate mounted to base of jig for providing desired negative flat on front clearance angle of toolbit. Shank of toolbit is clamped to this same plate, and aligned to the angle of the side clearance edge. The relative position of these two planes assures accuracy of flat on cutting edge. Lapping time is 30 sec max.

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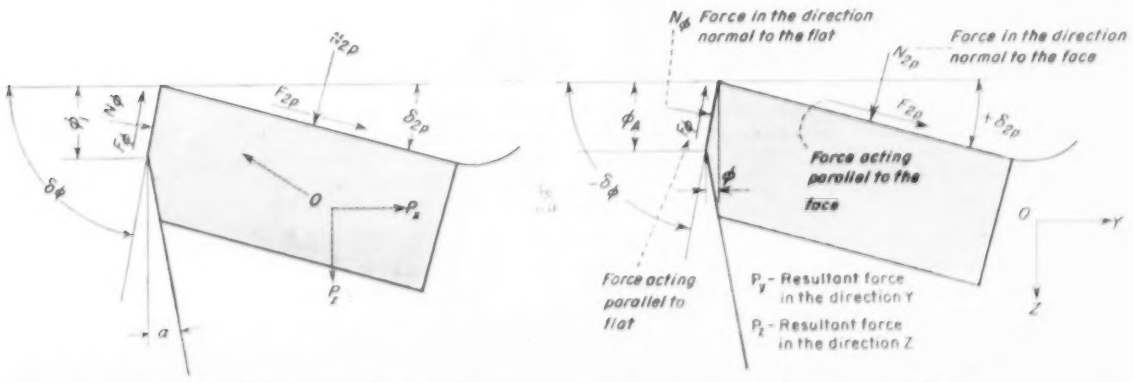

Force in the direction normal to the flat
Force in the direction normal to the face
Force acting parallel to the face
Force acting parallel to flat
Py - Resultant force in the direction Y
Pz - Resultant force in the direction Z

Fig 5.. Effect of speed on cutting forces was measured on a series of toolbits whose geometry was essentially as shown above. Different values for δ_{2p}, ϕ_1 and $\delta\phi$, were used throughout the five series of tests.

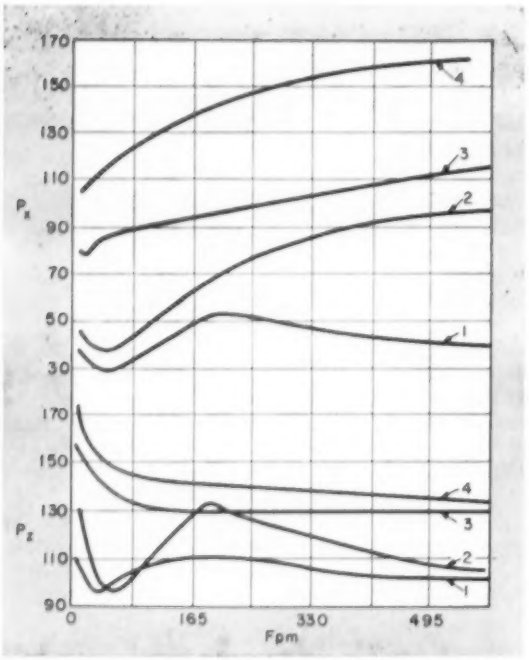


Fig 6 . . Effect of flat length, ϕ_1, was tested under the following machining conditions to measure its influence on force P_z and speed in fpm. Depth of cut 0.080 in., feed 0.008 ipr, δ_{sp} 0°, and $\delta\phi$ −80°. Curve 1, $\phi_1 = 0$; curve 2, $\phi_1 = 0.008$ in.; curve 3, $\phi_1 = 0.016$ in.; curve 4, $\phi_1 = 0.020$ in.

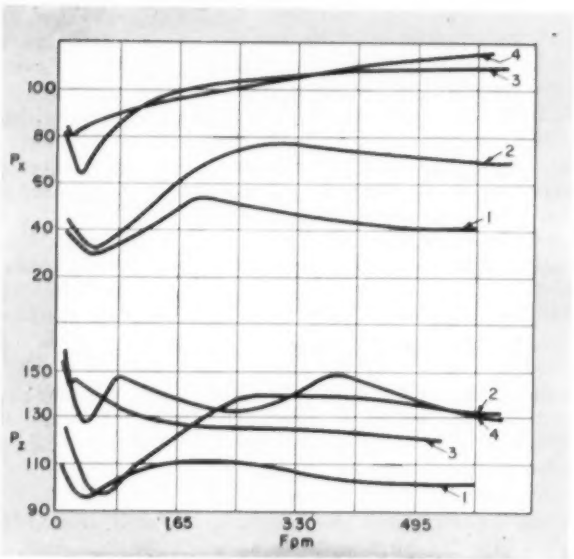


Fig 8 . . Effect of the top rake angle on the flat, $\delta\phi$, was investigated and its influence on the forces P_x and P_z against speed was measured under the following machining conditions: depth of cut 0.080 in., feed 0.008ip, $\delta_{sp} = 0°$. Curve 1, $\phi_1 = 0$; curve 2, $\phi_1 = 0.004$ in. and $\delta\phi = -90$; cuve 3, $\phi_1 = 0.016$ in. and $\delta\phi = -80°$; curve 4, $\phi_1 = 0.016$ in. and $\delta\phi = -70°$.

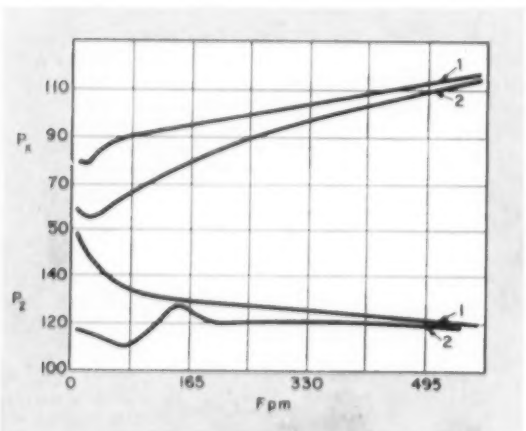


Fig 7 . . Effect of top rake angle beyond the flat was investigated and its influence on the forces P_x and P_z against speed was measured, under the following machining conditions: depth of cut 0.080 in., feed 0.008 ipr, $\delta\phi = -80°$, and $\phi_1 = 0.018$ in. Curve 1, $\delta_{sp} = 0°$; curve 2, $\delta_{sp} = 15°$.

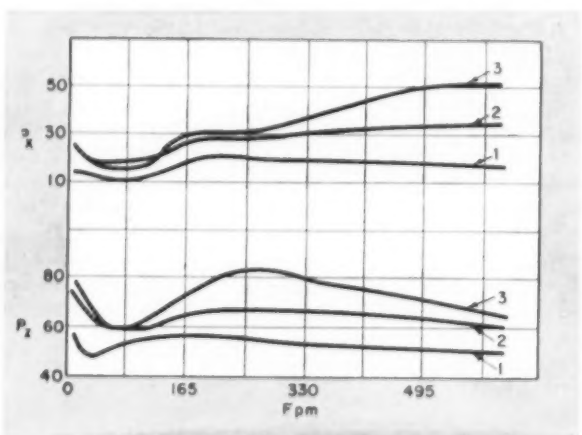


Fig 9 . . Effect of the cutting force on the machining speed under various values for the wear land on the front clearance angle was measured. Machining conditions were: depth of cut 0.040 in., feed 0.008 ipr, and $\delta_{sp} = 0°$. Curve 1, $\phi_1 = 0$; curve 2, $\phi_1 = 0.008$ in. and $\delta\phi = -80°$; curve 3, $\phi_1 = 0.028$ in.

cause vibration, the fifth series of tests was conducted to determine the effect of cutting forces on the machining speed, using a toolbit with a wear land of 0.028 in. along the front cutting edge.

Conclusions were:

1. Provision of an anti-chatter flat changes the character of the influence of machining forces, Px and Py, on the speed of machining. With an increased length of the flat ϕ_1, the range of cutting speeds (for which cutting forces drop with increasing speeds) becomes narrower. For certain values of ϕ_1 directed forward, the forces Px and Py increase without a serious change or variety, with increasing machining speed. The degree of intensity of these forces is greater with higher speeds, if the top rake beyond the flat is increased. When the flat ϕ_1 is equal to 0.008

in., the value of force Px increases from 1.3 to 2.5 times. This same force increases from 2.5 to 4 times when dimension ϕ_1 is equal to 0.020 in.

2. There is no appreciable change in the characteristics of force P_z when influenced by the machining speed and when using toolbits with a flat. In fact it is claimed that the degree of influence remains the same as for toolbits without a flat. Absolute values of P_z increase 1.05 to 1.2 times when the cutting tool has a flat ϕ_1, equal to 0.008 in. and 1.3 to 1.5 times when ϕ_1 equals 0.020 in.

3. Changes in the character of forces Px and Py, as influenced by the machining speed and cutting tools which have considerable wear on the front cutting edge, differ in principle from analogous relations applicable to sharp tools. Tools with a wear land have the same characteristics as those obtained for cutting tools with an anti-chatter flat.

4. Power consumption, when machining with 0.008 in. to 0.012 in. flat on the toolbit, does not exceed the power required for cutting tools having a wear land of from 0.020 to 0.028 in. on the cutting edge. To clarify this relationship, it was necessary to investigate the system of forces acting on the double front edge of the dynamometer, identical to the two front cutting edges shown on the geometry of the toolbit in Fig 5.

MACHINING FORCES

The influence of the machining forces on the cutting speed indicates that the length of chip contact with the cutting edge decreases with increasing speed, while the pressure per unit of contact area decreases. Consequently, the relative role of the flat becomes more important. With increased machining speed, forces acting on the flat assume an increasing influence on forces Px and Py. An increase on the force $N\phi$ and $F\phi$ will bring about an increase of the forces Py and P_z. An increase in Py will simultaneously bring about a decrease in N_{2p}. It was found that for certain combinations of ϕ_1, $\delta\phi$, and ϕ_{2p}, the force Py will increase directly with increasing speed.

Change in value of P_z in respect to the machining speed is determined by the change of the total friction force on the front clearance edge of the tool. Because of the importance of the flat, and the intensified plastic deformation, total friction force P_z will increase. However, increased cutting speed will in itself bring about a decrease of this friction force.

SELF-GENERATED VIBRATIONS

A number of Soviet engineers have found that vibrations which are serious and which occur most frequently during machining take place without any periodic external excitation, ie, they are self-generated. Self-generated vibrations are sustained by the continuous flow of energy (from the driving motor) which is partly transformed into alternating energy, and introduced into the system during each cycle. If the introduced portion of energy decreases, and if resistances occur in the system that have to be overcome, the entire or part of the vibration energy will be consumed. Also, the self-generated oscillation will decrease in amplitude or cease altogether.

The Russians claim that if the vibratory motion does take place, the existence of any influence exerted by the force on the speed will effect the energy balance of the vibrating system. When vibration occurs during machining and the entire range of speed variations is within limits, and when the machining force decreases with increasing speed, an additional variable force will exist. This particular vibration coincides in phase with the frequency of the oscillation movement; consequently, additional energy is fed into the system during each of these oscillation periods.

In instances of oscillation, where the speed is in the range in which forces increase with speed, an additional alternating force exists during vibrations. This alternating force is opposite to the phase of the vibration movement and in each period, energy is drawn off from the system. Consequently, the existence of a decreasing branch in the machining force and speed characteristics, gives the appearance of an increase in intensity of the self-generated oscillations of the system (machine tool-workpiece-cutting tool).

Presence of the ascending branch in the machine force-speed characteristic acts in the opposite direction, ie, it prevents the occurrence of self-generated oscillations and reduces the amplitude of such vibrations.

For certain values of the flat, the cutting force increases without change or variety, with increased speed. This fact is attributed to an occurence of oscillations in the system. An additional alternating force will simultaneously be present, which is opposite in phase to the speed of the oscillation movement.

Tool life of single-point tools has been considerably improved, according to the latest information from Soviet engineers.*

They are currently mass-producing a cutting tool which has just recently been standardized for lathe work. Known as the Gustin development, tool life of this lathe tool was increased 80 times over

* *Data compiled from production tests run at the Charkov Tractor factory.*

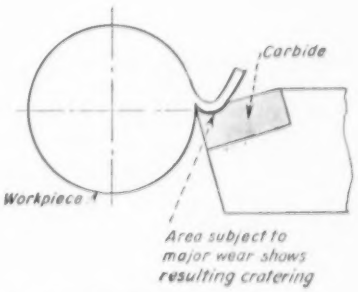


Fig 10.. Tests, in Russia, on conventional turning tools, indicated that heat generated in turning contributes to the rapid breakdown of the cutting edge. They also found carbide tipped cutters are susceptible to mechanical injury caused by the machined chips grooving the carbide tip to such a high degree that the cutting edge breaks off

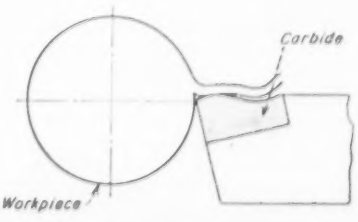


Fig 11.. Sine curve ground on the top rake of turning tools used in Russia increased tool life from 80 to 200 times

all the other tools tested. Tests showed that three conventional tools wore out before the Gustin tool required resharpening. Final results showed that the newly designed tool machined 431 pieces before resharpening, while tools with conventional cutter geometry could machine only 5 or 6 of the same pieces before resharpening.

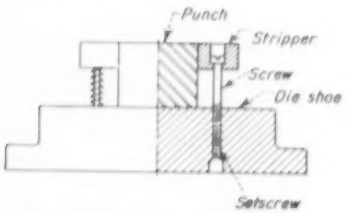
After studying major points of wear on conventionally ground tools, Fig 10, and after testing several other newly developed shapes, the cutting-tool geometry shown in Fig 11 (Gustin design), was accepted as the new standard. Because tool wear is a factor that varies according to the degree of machining per piece, some tests conducted with this tool showed an increase in tool life of 200 times.

The Gustin tool uses a sine curve on the top rake to force the chips to slide along the curves without exerting practically any pressure on the tool. Tool wear is also reduced at the cutting edge because the center of chip pressure is located farther inside, away from this edge.

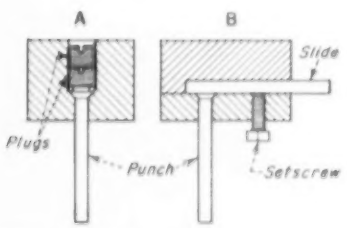
One of the tests run on the machining of power wheel hubs used a conventional turning tool which had a tool life between regrinds, of from 5 to 10 hubs. On this same job the Gustin tool boosted the number of machined hubs to 350 pieces between regrinds. Cutting conditions were: depth of cut 0.234 in.; feed 0.029 ipr.; and speed of 2.535 ipm. Grinding the sine curve on the top rake is more difficult than grinding conventional top rakes; however, this drawback is insignificant when compared to the greater tool life and higher production.

Diemaker's Kinks

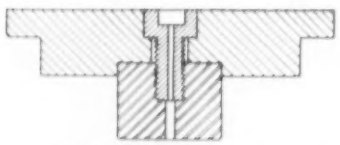
FEDERICO STRASSER



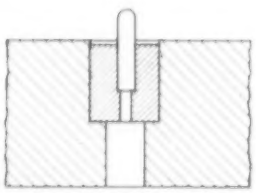
MOVABLE STRIPPER PLATES for compound dies must be carefully readjusted to the correct height with respect to the blanking punch, after the latter is reground. Stripper screws may be secured against loosening by a setscrew in the die shoe and bearing on the end of the stripper screw.



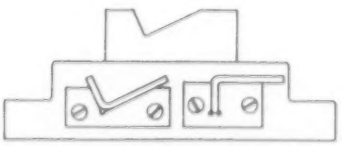
RETRACTABLE piercing punches are sometimes required: for example, in multi-purpose dies. Here are two methods of applications. Design *A* employs two setscrews of the socket-head or screw-slot type. To make the piercing punch inoperative, remove the upper setscrew and back out the lower one until the punch will not pierce the material. This design requires dismantling the punch holder. Design *B* utilizes a hardened tool-steel backing plate behind the piercing punch. If the slide is withdrawn, the punch becomes inoperative.



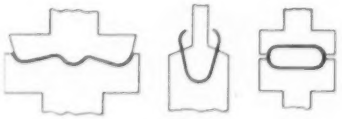
AIR VENTS are essential in draw punches, and they are placed on the punch axis. If the punch is held with a screw at this location, then drill the vent hole through the screw as well as the punch.



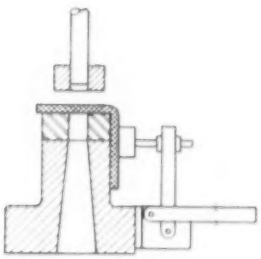
LOCATING PINS for any kind of tool should be bushed. Then, in driving out the pins, the bushing is easily replaced, or a new bushing with an eccentric hole can be substituted if the pin location is to be changed.



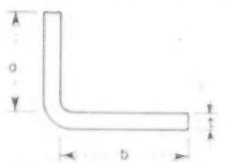
GAGES for checking formed or bent pieces may well be fastened to a stationary part of the tool, so they are not lost and are always available for the operator's use.



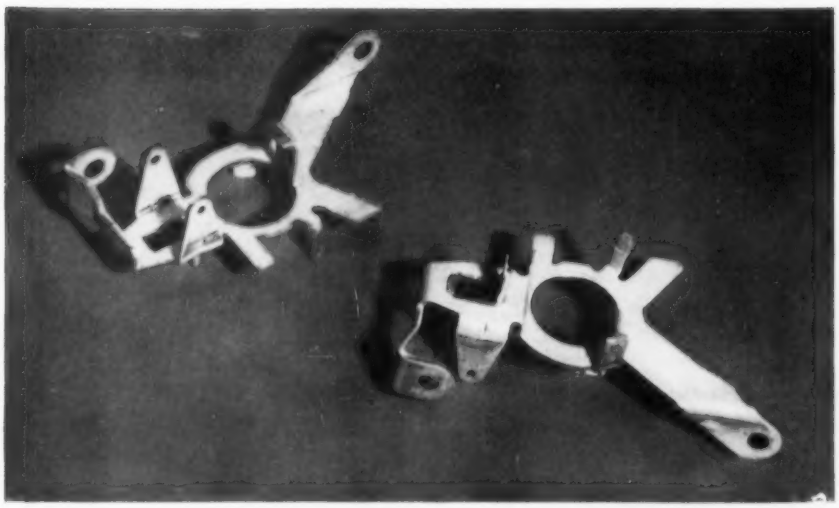
OVAL TUBING is best formed in three operations. You can mount the dies together in a press or press brake and achieve a good work rhythm.



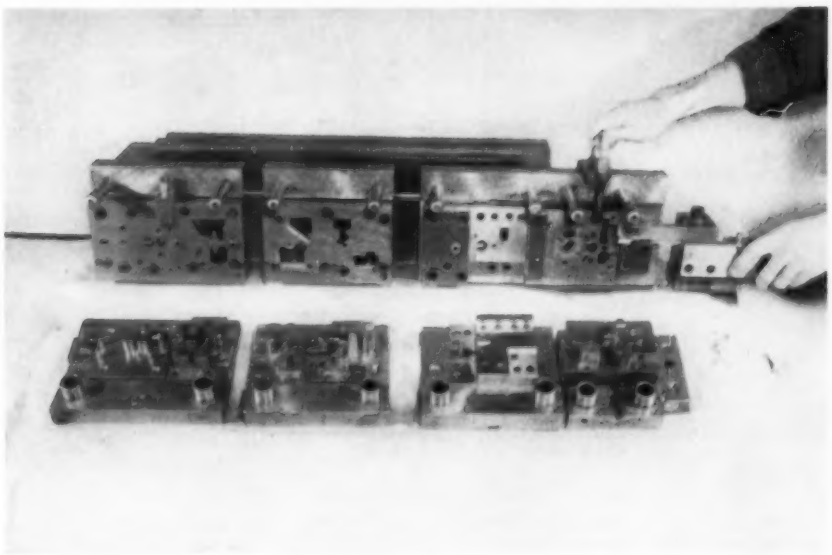
A TOGGLE CLAMP should be used to hold the long leg of a formed member when punching or trimming the short leg. Such clamps are quickly used and add safety.



BEND ALLOWANCES are often best determined by trial and error. Theoretically, the allowance $L = a + b + 0.4t$. But for purposes of trial, begin with experimental blanks that are too short and work up to the theoretical value.



BRACKETS MADE IN MULTI-SLIDE have ears formed to both sides, and some are offset. Position and size of ears and holes are held within 0.004-in., despite the fact all holes are pierced before forming



MADE IN FOUR SECTIONS, progressive die used in Multislide is made to same high accuracy required of progressive dies for vertical presses. Diemaker is adjusting forming slide for offset ear

Multislide form punches get mist lubrication

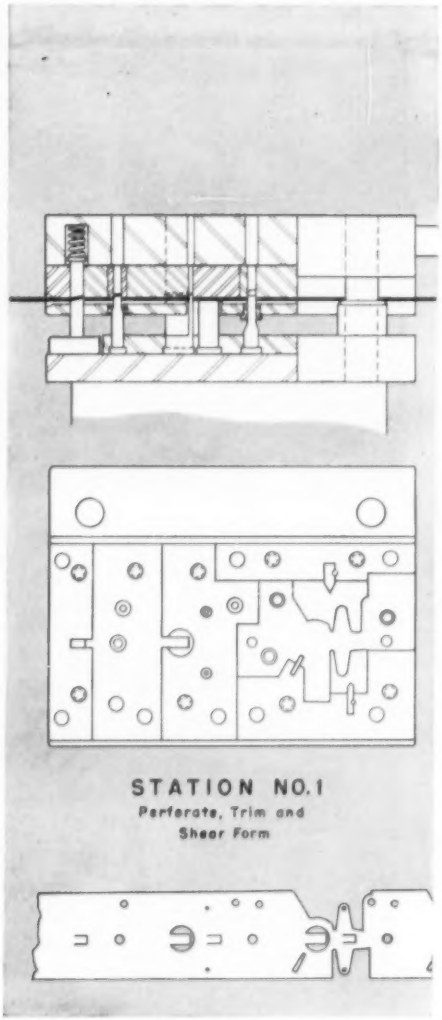
A severe wear problem on the forming punches has been overcome by mist lubrication, and in addition the Multislide can be operated at higher speed

PAUL KAISER, JR. and PHILIP P KAISER,
P-K TOOL & MANUFACTURING CO. CHICAGO

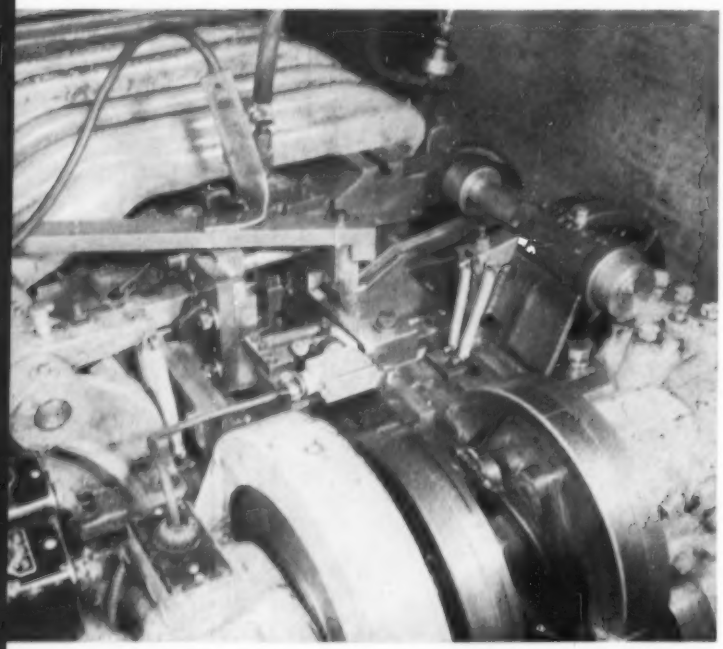
Mounting brackets for an automotive thermostat are made in a U S No. 33 Multislide blanking and forming machine at 60 strokes per min. from 18-ga (0.0478-in. thick), 3⅛-in. wide coiled strip stock. Die design is such that the completed parts easily are held within 0.004-in. specified tolerances, despite the fact all holes are pierced before the brackets are formed.

Conventional Multislide die design practice was followed in making the tools for these brackets—with the exception that die accuracy is of a higher-than-usual level to insure long life with low main-

Multislide form punches get mist lubrication . . .



OPERATIONS PERFORMED at each die station are indicated in above layout and skeleton strip. Feed of 3¼ ips is monitored by parallelogram-type actuator and precision miniature switch at right to protect punches and die



MIST LUBRICATION nozzle and air ejector hose are supported from tiebar above third and fourth die stations. Precision miniature switch (center) is actuated by probe to prevent machine cycling if strip is misfed

tenance cost. Positive mechanical action is used instead of springs to control the forming tools; air ejection replaces the usual mechanical action.

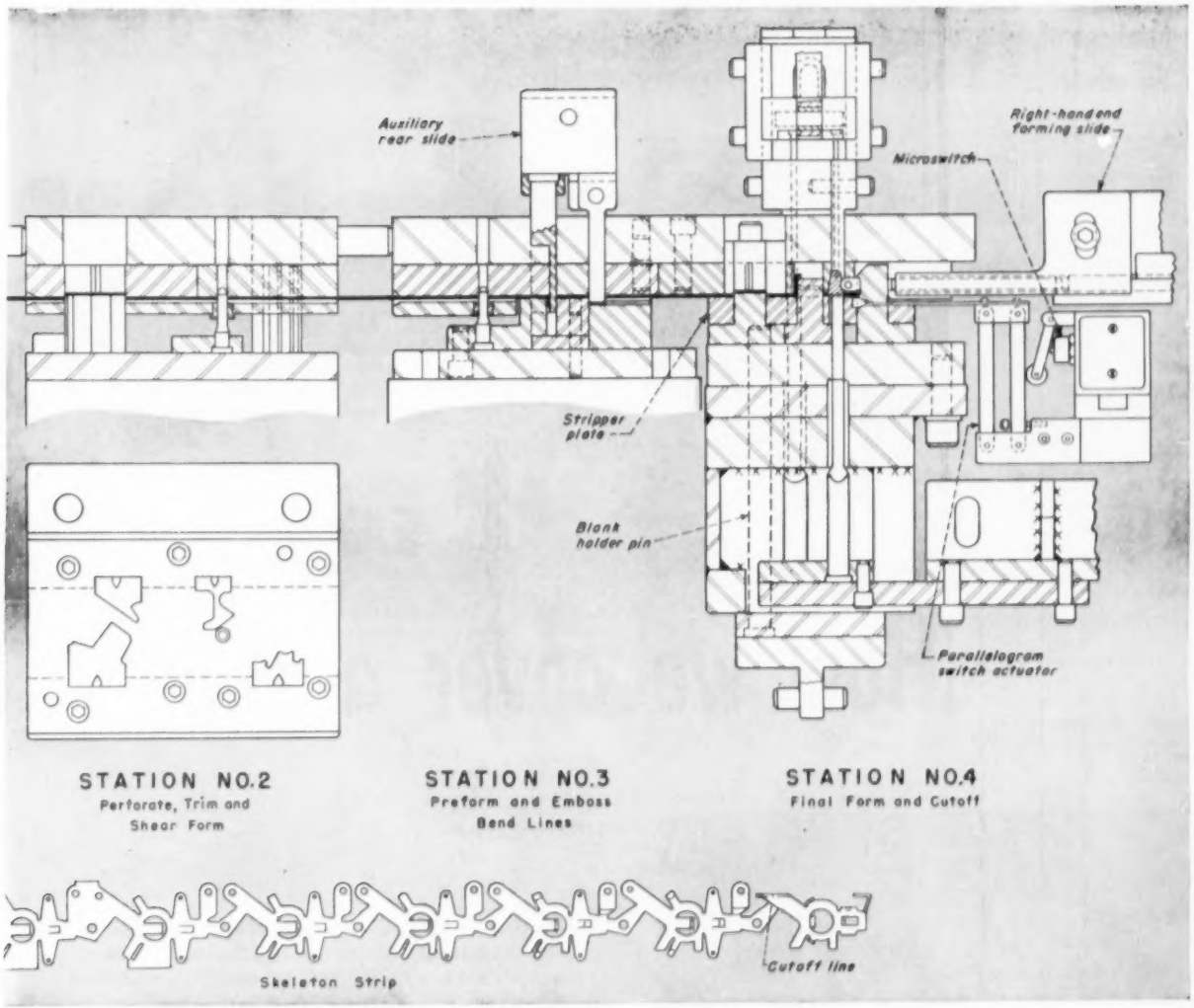
CYCLE OF OPERATION

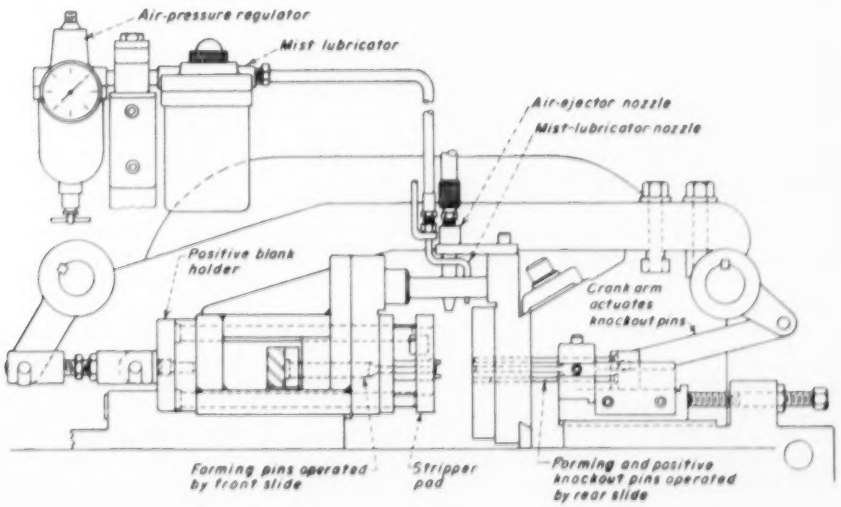
The strip is perforated, trimmed and shear-formed in the first two dieheads. Two preforms are made, and three bend lines are embossed in the third diehead. A rear auxiliary slide is used at this station, and preforming is done from back to front. A large strain bar was added at this position to back up the auxiliary slide and maintain die alignment.

The brackets are formed and cut off in the fourth and final station. In this position, the front slide carries a cam-actuated blank holder to hold the end of the skeleton strip against an extension on the dieset. The front forming tool acts first, forms the part, then dwells while the rear slide forms toward the front. Finally, the right-hand, end-forming slide forms an offset ear through an opening in the forming tool on the front slide.

Stripping is performed in opposing directions, with positive knockout pins carried in the front slide, and with cam-operated ejector pins in the stationary form tool. This virtually eliminated jams caused by incomplete stripping.

An extensive set of gages is used to maintain quality control while the machine is in operation. The machine operator spends his time handling material, checking the machine, and inspecting parts. Multiple-machine operation is not economic in this case.





PIECE IS CUTOFF and formed in fourth and final station, where blank holder is cam actuated to hold part firmly against extension of dieset. Stripping is done in opposing directions to prevent jams

Meetings of the minds...

at a series of pre-show meetings helped the 20-man SPS team that visited the 1955 Machine Tool Show in Chicago concentrate on the exhibits most important to manufacturing. President H Thomas Hallowell, Jr center, is shown here in a last-minute meeting with 17 members of the show-team

How we cover a show

JAMES L MacDOWELL, superintendent of manufacturing, Fastener Division, STANDARD PRESSED STEEL CO, JENKINTOWN, PA

At Standard Pressed Steel, we're always buying machine tools. We do it within the framework of our capital investment program, which means we continually reinvest a large part of company earnings in new machines and accessories to boost our productivity and lower the cost of our products.

Because this policy has paid off, we take a long look at every new machine tool or gadget that comes on the market. We have a theory that you never know where your next new idea is coming from.

From experience and because no industry-wide exhibit of machine tools had been held since 1947, we felt sure that a lot of new ideas would come out of the Machine Tool Show in Chicago. When the 1955 show was announced, we took steps to cover it thoroughly.

Our first step was to decide who should go. We began by asking a question: "Who in the company should be consulted when a new machine is to be purchased?"

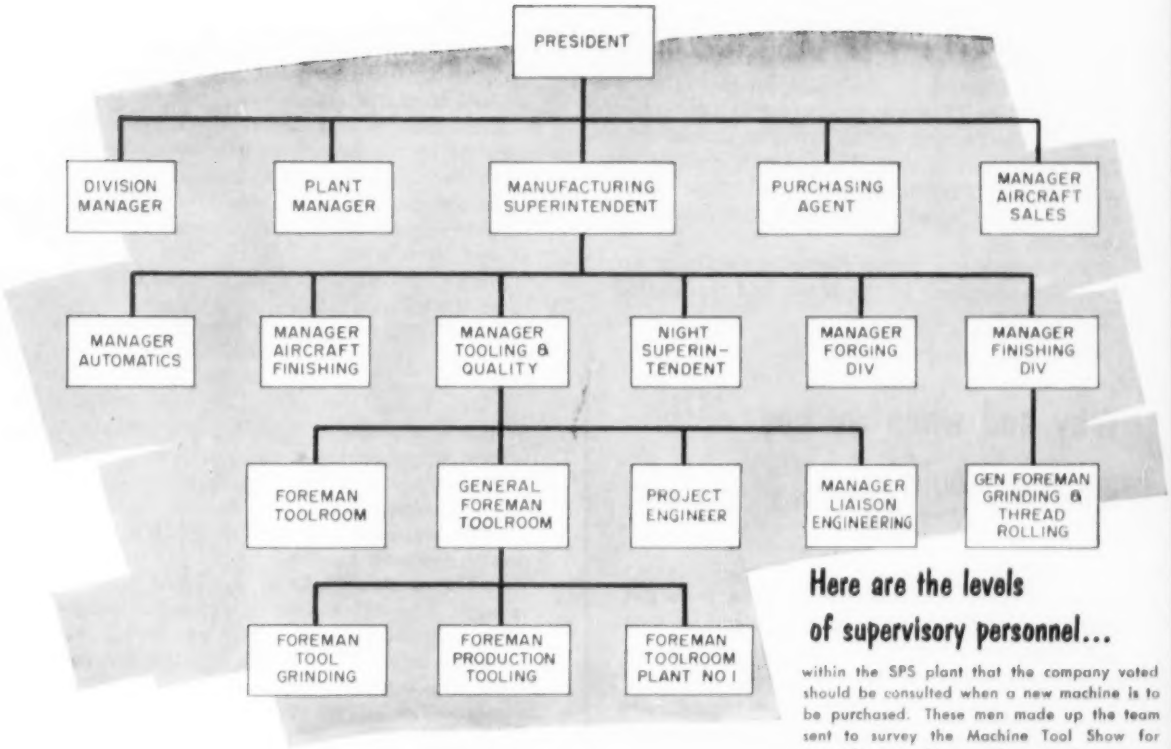
Our answer to that question led us to send a team of 20 men from our plant in Jenkintown.

We sent operating men from sections of the plant in which the need for cost reduction was evident. We sent key men from management and engineering positions to represent sections that use the types of machines we knew would be exhibited. We also sent purchasing people and members of top management.

Tom Hallowell, SPS president, went. A well-known champion of the use of capital investment in machinery and plant to increase productivity, he has translated theory into a working policy within our company. To him, knowledge of the newest developments in machine tools is a prerequisite to making ideas pay off. He attends foreign as well as domestic shows to keep a finger on the pulse of world advances in design. Recently named president of the American Standards Association, he is also holder of a number of machine-tool patents for his inventions.

Sid Matthews, project engineer in charge of machine tool specifications, attended, because he's the man who makes the preliminary analysis of all equipment we purchase. He must be completely familiar with technical and price details. He's been at this for a long time and can recite from memory most of the vital statistics for any given piece of equipment in use or under consideration. But there's no substitute for seeing a new machine in action and that's what he wanted to do.

Jack Moorhouse, director of purchases, was a vital cog in the team. He actually purchases our equipment. First-hand knowledge of the machinery available on the market is important to him as a basis



Here are the levels of supervisory personnel...

within the SPS plant that the company voted should be consulted when a new machine is to be purchased. These men made up the team sent to survey the Machine Tool Show for new ideas, machines and accessories

for evaluating his machine-tool purchase suggestions to the rest of us.

In addition, George Schwenzer, our tool room general foreman, and his key men—Charlie Wilson, Jay Rauch, Vince Diehle and Vern Colkett—were sent because they are the men who directly affect our tooling costs. In this business of precision metal manufacturing, you've got to have good tooling and plenty of it.

Jack Sherman, manager of Tooling, Quality & Engineering, went along as an expert in thread gages and gaging methods.

Every man on our Tool Show team went to Chicago with one purpose in mind: To bring back ideas that would increase our output, reduce our costs and improve our quality. No idea could be too small, no concept too large to receive consideration if it appeared to contribute to this end.

We're constantly designing improved fasteners that require better machine tools that will hold closer tolerances. This keeps us constantly on the lookout for new equipment. Sometimes we find the equipment we want is still on the designer's drawing board.

After we'd decided who was going, we held a series of meetings to discuss objectives and to review the advance information we had on the show

Impressed...

by what they see, H Thomas Hallowell, Jr, president (right) and Charles A Wilson, foreman, Tool & Die Section—watch carefully as this giant heavy-duty universal milling machine is put through its paces

More on next page... ▶

and on the machines we would see while in Chicago.

We had a problem, for example, in the thread-rolling section. For years now we've been turning out precision fasteners of all types on thread-rollers. With new types of material and new designs coming up, we felt certain that we could now purchase machines that would increase our flexibility and precision.

We knew that a number of manufacturers would have thread-rollers at the show, and we wanted to see them all put through their paces. There were, of course, a large number of other machines we wanted to see in action, too.

Each man was assigned specific machines and exhibits to see. At least two men were asked to cover each exhibit. Most of the men stayed at the show for three days on a rotating schedule so we would not have too many key people out of the plant at one time.

We are convinced that we profited from the show in at least five ways:

1. We bought some new machine tools. To date, our total expenditure has amounted to about $1,500,000.

2. We found the answer to our thread-rolling problem—a precision thread-roller, completely new in design, producing a complete range of sizes. It is rugged but sensitive. Hydraulically operated and electronically controlled, it is now installed in our Jenkintown plant. It typifies the trend in today's newly designed machine tools.

3. We harvested a lot of ideas that can be applied to some of our existing equipment. Many of the ideas included accessories. Some of our purchases included magnetic parallels for surface grinders, a super-finish lathe attachment, swivel chucks, and a special hold-down vise that prevents work from popping up like a piece of toast when the vise is tightened.

4. We also developed a number of recommendations for the future. Each man who went to the show has reported in writing his impressions and reactions to items, ideas and innovations and has recommended a course of action. Later, each man reported action that had been taken on his recommendations.

5. We also changed some of our thinking. We delayed placing an order for thread-roll attachments in order to get the newest model. We learned about a conveyor for our Magnaflux spray line. We talked to some of the country's leading experts on improving our specifications for tool steel.

Show results for us are both immediate and long range. Some machines and ideas are being introduced in our plant today. Other ideas will help guide our capital-investment program for years to come.

As part of our capital investment program we continually look for tomorrow's problems. We've found that, often as not, when a problem we've foreseen in this way becomes current we've got our finger on a machine for a process that provides a tailor-made answer.

One dividend from the show difficult to estimate in money terms is the boost to our men's morale from finding out for themselves that much of the machinery in our shops parallels in quality and design the newest and best the machine-tool industry has to offer.

To us, months later, the Machine Tool Show of 1955 is still big news. The new tools, new materials, new concepts and new methods displayed at Chicago were a big help to us.

Why and when we buy machine tools . . .

H. THOMAS HALLOWELL, JR., president

Basic policy at Standard Pressed Steel is to put more and more capital to work in terms of new and improved machines, to increase productivity and quality.

Profits, as much as 80% of them, are turned back into the company for the purchase of better machines and plant.

When do we replace machines? What is the formula? Our formula is a lack of formula. Generally, we replace a machine when the economics involved argue for it.

Spelling that out in some detail, a machine is replaced when:

1. **It stops producing at its rated capacity.**
2. **It cannot maintain the required tolerances or quality.**
3. **It requires undue maintenance or adjustments.**
4. **It becomes obsolete through introduction of new and better machines.**

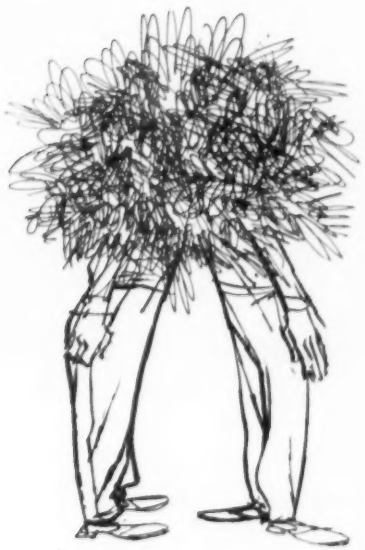
We also purchase new machine tools when:

1. **They are required to perform a new or unusual job, or to improve accuracy or quality of product.**
2. **It can be shown that a new machine will earn more profit after deducting all expenses and charges.**

Some of our machines are rebuilt, rather than replaced, when no machine of superior design is available at the time the machine would ordinarily be replaced, or when cost of the new machine would be disproportionate to its increase in productivity over the existing machine, if rebuilt.

Under this policy we will spend over $1,500,000 for new machine tools and accessories during the current year and by 1965 will have replaced upwards of 60% of our existing capital equipment.

Round Table



I Quit.....No; You're Fired!

"How come you had to go and fire Hudson, Ed? He was leaving anyway, but now he's got a 'canned' tag attached to his record—and his first job, too."

"So what? After I trained him so carefully, and gave him the most interesting jobs, the least he could do was let me in on his plans. But no, he comes in here this morning, packs his tools, and smugly announces he's going over to Ajax. Am I supposed to take that lying down?"

"You're being too vindictive, Ed. After all, he has as much right to look for a better opportunity as anyone else."

"Sure he has, but if he was so damned hot to get a better job, he might have mentioned it to me. After all, I swing a little weight around here. I could probably have gotten him a group-leader job."

"Lots of men like to do their own hunting, Ed. Maybe he had the idea that he was depending on you too much already."

"All I did was help him a little, Al. And that's the thanks I get."

"Maybe you're sore because you lost your white-haired boy, Ed."

"Sure I'm sore. You would be, too. And I'll tell you something else; Harrison is going to be burned up when he hears about it. He makes a point of giving two weeks' layoff notice, and he expects any worker to have the same decency. That's not asking too much."

"True enough, Ed; but I've seen a lot of guys get fired from here without any notice at all. Seems to me Hudson just figured out how you'd react, and beat you to it. He turned out to be right, if you ask me."

"I don't like his attitude, Al. He was well treated here, and all the thanks we get is a quick run-out the first chance he sees. Now I have to break in a new man cold, with nobody to do the work until he catches on. If that's fair treatment, I'll eat your hat."

***CAN** a company expect reasonable notice from workers who leave if it gives them ample notices? How often does a departing worker give the plant the same treatment he's seen the company give others? Your opinions can help others faced with this problem. Discussions of earlier topics start on page 320*

SHOP SHOTS

Industrial television does a real inspection job...

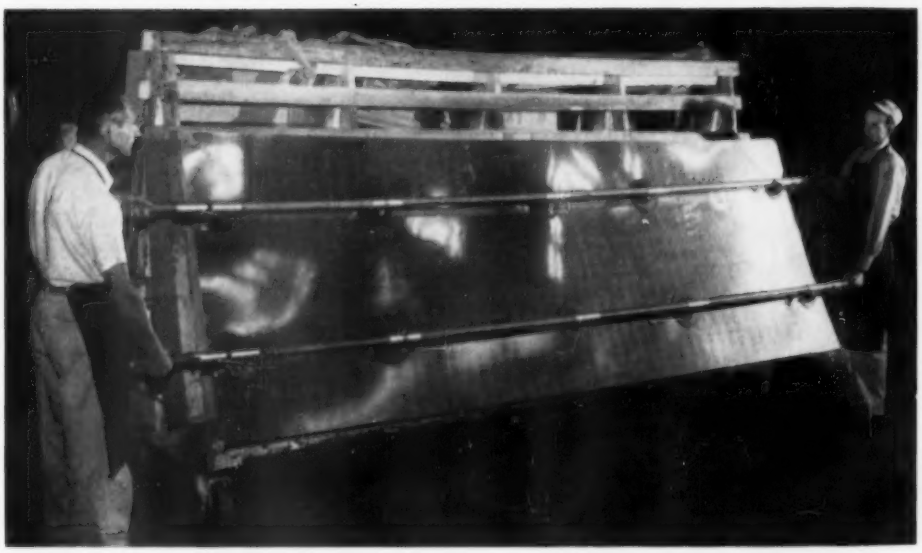
. . . at Continental Can. T V Eye camera fitted with microscope is focused on chrome-plated scraper blades held in bench fixture. Receiver shows image enlarged 288 times as operator slides blade through fixture. Inspectors work twice as fast and more accurately than with conventional eyepiece microscope

Automatic transmissions go abroad in prize-winning package . . .

. . . awarded to Jerome F Gould Corp by 1955 Protective Packaging and Materials Handling Competition. Six Borg-Warner units (for Jaguar, Mercedes-Benz, or Rootes cars) are nested on each pallet, two pallets are stacked, VPI paper is wrapped, and box top and sides are added. Whole package is wirebound and strapped, making up an 1860-lb unit, in 30 man-min

Scrap display keeps workers quality conscious . . .

. . . at Rheem Manufacturing. Main point is the big difference between new cost and scrap value of ruined items. Board is focal point of contest between departments



Glass-handling technique applies to sheet aluminum . . .

. . . at Convair-Ft Worth. These grippers are static vacuum bars. Object is to prevent even minor damage to aircraft skins —most important because of high speeds and high wing loadings. Plant is also developing overhead vacuum lifts, mechanical cups with vacuum pumps, and vacuum cups powered by compressed air using venturi prinicple

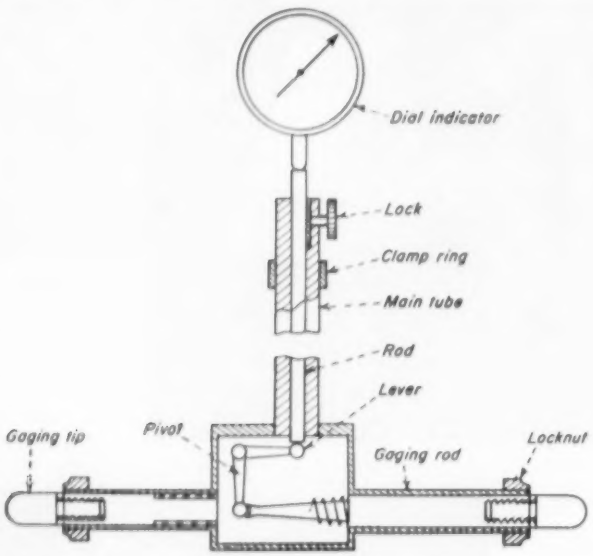
Portable fluorescent lamp helps check inside barrels . . .

. . . at Shell Oil. Lights are single-ended, covered with insulating vapor-tight plastic or open steel guards. Other reported uses are for inspecting wells, for trouble lights in bus maintenance, and for extra machine lamps. Light is cool, non-glaring, and shows true colors. Made by Day-Ray

Portable stockroom goes right to the line . . .

. . . at Martin Aircraft. Cart holds complete sets of assembly parts; is mounted on casters. Method beats hand carrying at line where full flowline of parts is not justified

Practical Ideas . . .



Lever Indicator Attachment Checks Deep-Bore Diameters

Long holes can be measured, and diameters can be checked for consistency, with this dial-indicator accessory, which is made up mostly of tubing and rods. For best results, use it with an indicator good to 0.0001 in.

The main tube can be as long as necessary, but it should be thick-wall tubing for strength and rigidity. Inside it is a long rod riding between the end of the indicator spindle and the lever mechanism below. The indicator is attached with a clamp—only the clamp ring on the tube is shown.

Below the main tube is a housing, welded or threaded to the tube, and made to protect the lever system. A right-angle lever transfers motion from the right-hand gaging rod to the vertical rod, which moves the indicator.

The left-hand rod is normally fixed by tightening the locknut, which compresses the fairly thin tubing outside the gaging rod. However, the gaging rod is spring-loaded to allow easy adjustments for different bore diameters—it can easily be extended or retracted within a limited range. Both gaging tips are threaded and hardened, and can be replaced if a different shape is necessary.

The right-hand gaging rod is also spring-loaded so it will extend to touch the ID of the bore, and a locknut allows clamping it if you need to pull the attachment out of the hole to mike across the gaging tips.

One way to use the attachment is this: First, use a micrometer and set the diameter you are checking, less about 0.005 in., across the gaging tips, and tighten both locknuts. Insert the attachment in the bore, release the right locknut, and add the increase in dial reading to the dimension set. For best gaging-tip life, the attachment should not be slid down a bore.

As little backlash as possible is necessary; and wearing surfaces should be hardened. *A C Bhattacharya, Calcutta, India.*

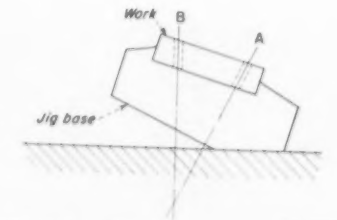
Latch Tilts Jig For Angle Drilling

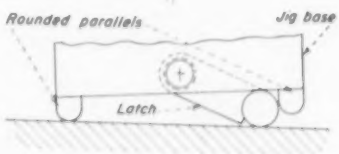
Sometimes you can use a baseplate with two bottom surfaces, angled to each other, to drill two holes at different angles through the same work. But in some cases this results in an unstable jig that may become overbalanced during drilling, which could ruin the work and break the drill.

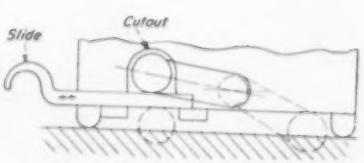
A swinging-latch jig built something like a sine bar does the job. It has two rounded base parallels and a third movable parallel pivoted between them. The first hole is drilled with the movable parallel to one side; the second with it to the other side. Actually, you could make the latch with a small hardened spindle, and could slip on hollow rollers of several dimensions, depending on how much tilt was required.

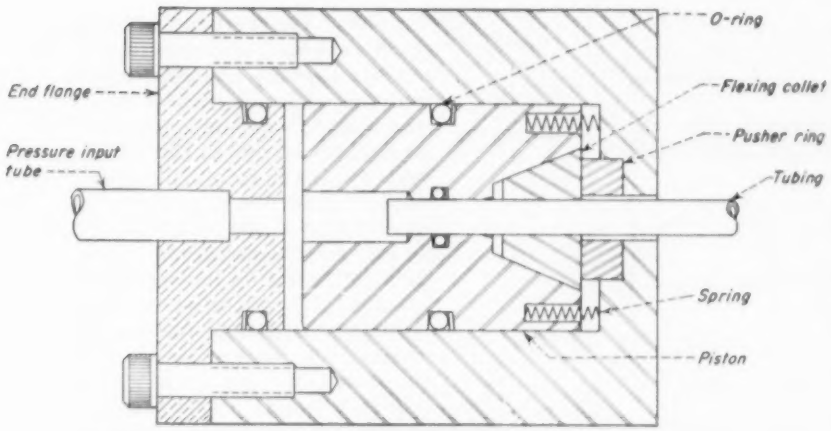
The pivot for the latch should be midway between the rounded parallels so the pivoted parallel, which is really a roller, nests up into either corner.

A further development is to cut out a slot in the base to admit the roller, and add a slide to the bottom of the jig base so the roller and latch can be slipped up into the jig base, thus allowing the jig to be used flat and parallel to the drillpress table. If the latch and sine roller are being used, the slide is pushed up to close over the cutout, and the bottom of the slide acts as the bottom surface of the base. *Reginald Scott, Knottingley, England.*









High-Pressure-Tubing Test Fixture

Shops which do a lot of high-pressure piping find that a pre-use pressure test of component tubing is very useful in reducing rework due to tubing leaks. This test, while saving costs, is in itself a costly operation. Holding and sealing of tubing for pressure testing requires that the ends be either soldered or held by some mechanical means, such as a compression or flare fitting. The cost of ferrules or flaring, plus later removal of the fitting nuts, can be substantial.

There are two basic problems involved. The tube joint must be sealed, and the tube end must be held to prevent the application of pressure from blowing it out of the fixture. Shown here is a fixture which will accomplish both these functions, and yet requires only that the tube end be inserted into the fixture and simply withdrawn after the pressure test.

Suppose for example that we are receiving ¼-in.-OD tubing in 50 ft. coils. The tubing is to operate at 3000 psi., so pressure test would be at 4500 psi. Because of high pressure hazards, the work will be performed hydrostatically.

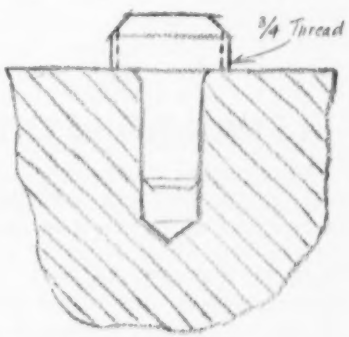
The ends of the tubing coil are deburred with a commercial tool which chamfers as well as removes burrs. Then the ends are pushed into a fixture. Fluid is allowed to flow through the tubing to evacuate the air, and the drain valve is closed and pressure raised to the required value. After test pressure is removed, tubing ends are withdrawn from the fixture.

Here is the operation of the fixture. The tube is inserted through the housing opening, pusher ring, collet, O-ring chamber, and piston. The collet should be about 1/64 in. larger in ID than the tube OD, measured in "free" position. A Rubberflex collet will close ⅛ in. smaller than its free position. (Also, a collet of the type used in tap drivers can be used).

When pressure is admitted to a fixture through the input tube, the restriction to flow caused by O-rings causes the piston to move to the right of the body. The reason the piston moves, rather than the tube, is that it is forced out because of its greater area. This area also cause the piston to be sensitive to low pressures. The piston moving to the right causes the collet to be pushed into the cavity of the piston by the pusher ring. This motion causes it to close tightly on the tube, and, as the pressure in the fixture rises, the collet grips more tightly. Thus when the pressure rise exerts more pressure on the tube to push it out of the fixture, the increase in gripping pressure prevents this from occurring.

For extreme pressure applications, it is a good idea to limit amount of collet closure by adjusting the length of the pusher ring to allow the piston to bottom on the entry wall of the body. When pressure is relieved, springs cause the piston to move to the left, so the collet releases the tube and allows its easy withdrawal from the fixture. Springs should only be of sufficient strength to over-ride the frictional resistance of the O ring. The pressure input tube is silver-brazed into the end flange, which flange is provided with an O-ring to effect a seal with the body. All O-rings should be backed up with anti-extrusion rings, for high-pressure service. Materials used in this device allow water to be used as the hydrostatic fluid. A number of these fixtures used together permit multiple testing.

C B Weidner, Tool Engineer, Air Products, Inc, Emmaus, Pa

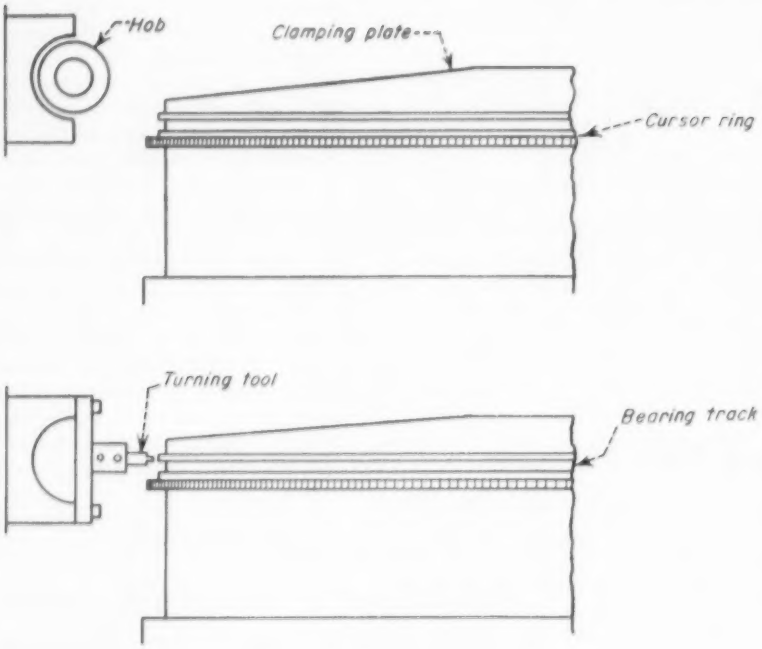


Threaded Cap Aids Pin Removal

In designing fixtures, studs are often provided as rest pads for the work. When making such a design, it is always good practice to provide a through hole to knock the pin out in case it is necessary to change the detail for any reason.

Occasionally, however, tool design will not permit this procedure, and the studs are pressed in blind holes. In that case, the design shown here can often be useful. The OD of the stock is threaded, as shown, and removed by simply threading a nut onto the stock and feeding the nut in until the pin is removed. If the pin is tight enough in the hole to resist being pulled out, it is tight enough to resist turning as the nut is threaded on.

C. Andrews, Dayton, Ohio



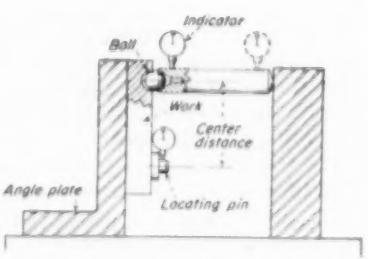
In-Place-Trued OD Meets Tolerance

Presentation units of radar equipment has a part known as the cursor ring, which is an aluminum-bronze ring about 17 in. in dia. with 532 teeth, 32 DP, or so. In the instrument this ring rotates at very low torque, running on an integral track supported by stationary ball races. Concentricity tolerance for track and pitch diameter of the gear teeth is about 0.0005 in. tir.

An easy method to attain this degree of accuracy is described here. First, the blank must be stabilized by suitable heat-treatment, and then finish-turned. The blank must be free from all internal stress, and must be completely inert. The track diameter is left somewhat oversized—about 0.010 in. The job is mounted on the arbor, well supported, trued up, and gear cutting is completed. The work is not removed from the machine.

The next stage is to true up the track. This is done by first attaching a small turning tool on the hob head, and advancing the work so that a light skim cut is taken at fine feed. A high finish is required so the tool must be sharp. It will be realized the work spindle at this high number of teeth will be rotating too slowly for turning, so the dividing train is changed to give the table a speed of about 60 rpm. In cutting a series of these parts, we have found that the track-turning operation may be done before gear cutting, so that only one change of speed is necessary for each two rings.

A H Phillips, Kent, England



Find Center Of Depression

Inspecting a workpiece to find the distance from a locating pin to the center of a ball seat or similar depression requires a bit of doing. Here's one way to handle it:

First, take a piece of thick drill rod and drill a centerhole in one end, exactly on center. Round off or make a cone point at the other end. Next, take a steel bearing ball slightly larger in diameter than the depression, and mount the ball in the end of the centerdrilled rod, holding the ball in the depression, as illustrated. The work should be mounted on an angle plate, and a second angle plate or block should be backed up against the off end of the drill rod.

Now the drill rod can be indicated from a height gage to level it up, and the distance between the top of the drill rod and the locating pin can be measured. Be sure to allow for thickness of the rod and the pin. *Henry A Roy, Devon, Conn.*

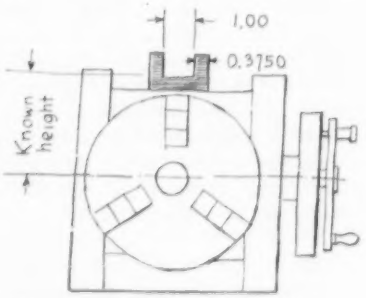


Plate On Dividing Head Cuts Milling Setup Time

To cut the time required to set up work on a milling machine, when using a dividing head, we adopted this simple method. We mounted an accurately 1-in.-grooved plate on the top of the head. Then, to set up to a given dimension from the centerline of the head, we simply measure from the inside edge of the plate to the cutter, using depth micrometer or gage blocks.

In cases where the cutter has to cut more than the block permits a measurement, we put a 1-in. gage block in the groove and measure outward from the edge of the block.

The plate is milled or ground to a certain height from the center of the dividing-head chuck.

Arnold Koch, Milton, Ontario, Canada

Tailstock-Mounted Chuck Supports Large-Diameter Work

The need often arises to hold in a lathe tailstock large diameter pipe or tubing for turning, threading, or parting. We have developed a tool to hold such work. The device is quite simple. A standard 4-jaw chuck has been modified by boring a diameter in its body to accept a standard live center with a revolving housing. The center is retained in the chuck by a ring of steel bolted to the chuck body, as shown in the sketch below.

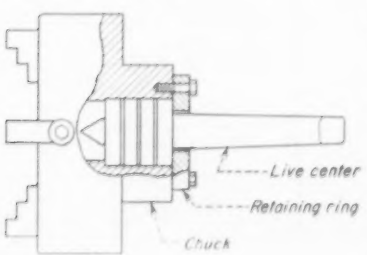
In the past, if we performed a parting operation on large-diameter pipe, we would have gone through these steps. Chuck and true the pipe in the headstock, set up for machining a true diameter for a steadyrest on its outside diameter, set up a steadyrest, and proceed with the work. This involves a lot of time, and setup is cumbersome.

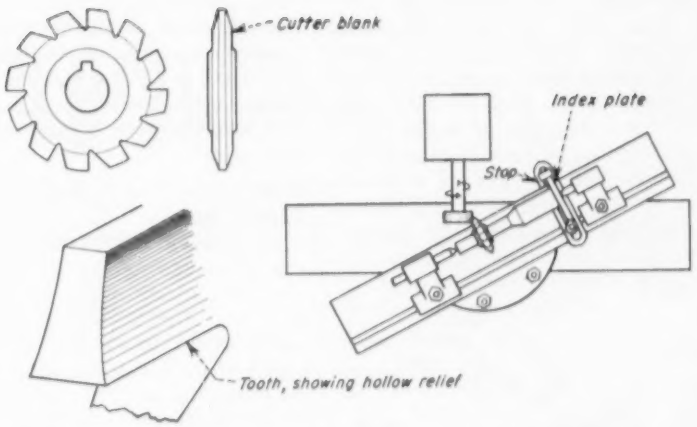
Our 4-jaw chuck in the tailstock allows the operator to indicate or true the pipe in both headstock and tailstock positions, after which the piece is ready to be cut. Work is more rigid when held in this manner, because it is gripped by the jaws of the chuck, and not contained in the steadyrest. Chatter is virtually eliminated, and speeds and feeds are the same as for normal turning and threading.

Note that the chuck bore is shouldered to prevent it from slipping too far back on the live center.

We have applied this idea many times in our shop, and it has proven useful in a wide variety of setups involving different materials and operations.

Carl Schreck, foreman, machine shops unit, Knolls Atomic Power Laboratory, General Electric Co, Schenectady, NY





Shop-Made Thread-Milling Cutters

Our 4½x12 in. thread miller is in frequent demand for producing many sizes of single and multi-start threads. These vary considerably in the various elements of lead, pitch, helix, and pressure angles.

If our needs are known soon enough, the necessary cutters can be obtained from suppliers in the normal way. However, in many cases, the job must be done before the cutters could be delivered, so the method we have worked out here for making these cutters has proven both profitable and accurate.

The first step is to provide a stock of hardened gashed blanks, hardened to about R_c 60, ground in bore and on faces with the necessary keyway in place. With the description of the thread required, the cutter blank is mounted on an arbor between centers on a cutter grinder.

The arbor is fitted at the right end with an accurate index plate which corresponds to the number of gashes in the cutter blank. Centers on the grinder must be positioned to locate the cutter blank over the center of the table swivel, and the top of the table is set with the pressure angle required.

The wheelhead of the grinder is set at right angles to the slanting table, and a fine grinding wheel of about 2 in. dia is mounted and trued up.

The wheel will usually have to use the spindle extension to reach over to the cutter when the table is set to the pressure angle. The index plate is engaged to click over the adjustable stop finger. The blank of the arbor is now set so that the gash is horizontal, and the grinding wheel is fed in on one side to produce a hollow-ground cut when the cross feed of the grinder is reciprocated.

To do this, the wheel center must be lower than the cutter-arbor center. Each tooth of the cutter is ground in turn until it sparks out with two or more passes usually necessary. The table is then swung to the pressure angle for the other side, which is treated in the same manner. Stock is ground off to bring the sides of the cutter equal and centered. The opposite side of the grinding wheel is used for the second side and, if possible, rotation of the wheel is reversed, so that identical conditions are kept for both sides of the cutter.

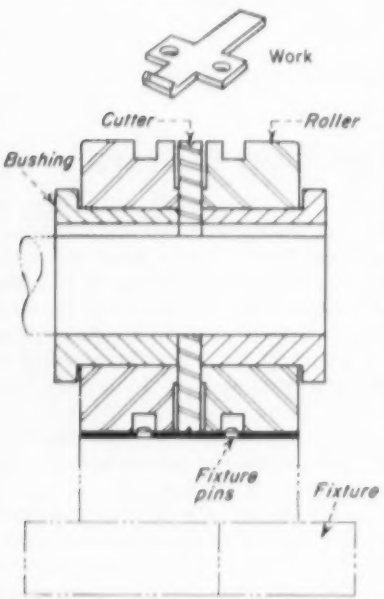
The next step is to grind faces of the gashes and top width to the required size. Following this, without removing the cutter from the arbor, profile of the cutter tooth is inspected and measured by projecting it in an optical comparator. If necessary, adjustments are made, and the test cut is tried on the thread miller. This thread is projected, and if it is satisfactory,

(Please turn page)

the cutter is then ready for use.

The cutter can be made ready for work in about an hour, with the cutting edges producing a fine smooth finish. Cutters will stand up for a long run of the toughest tool steels, and have been made by this method for threads as small as 100 DP. The maximum size of thread is limited only by the capacity of the thread miller.

A H Phillips, Kent, England



Spindle Rollers Clamp Miller Work

Some work, particularly parts with holes that can be slipped over fixture pins for location, can be milled without fixture clamps. Actual clamping is done by rollers mounted on the miller arbor, on each side of the cutter.

This job was milling a V-shaped shoulder on a small pierced part. It had two holes, so two short fixture pins kept it from slipping or twisting.

The rollers were fitted on the arbor with keyed-and-shouldered bronze bushings. The rollers themselves were hardened and ground to a fine finish, and they rotate freely on the bushings.

As the cutter comes across the work, both rollers press on the work, preventing it from coming loose. This makes loading and unloading parts quick. To prevent interference with the cutter, both rollers are relieved on the faces next to cutter .*Peter Kopeck, Stamford, Conn.*

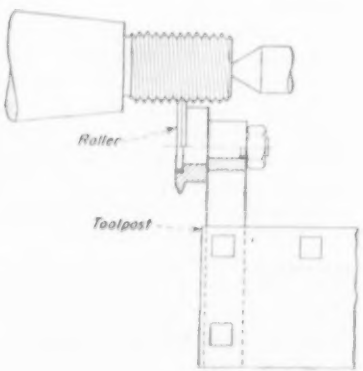
Emergency Thread-Size Corrections

Threads which are cut too small sometimes cause parts to be scrapped, which might otherwise be used. With the rolling tool as shown here, threads can be readjusted to the right size. Instead of the threading tool, this rolling tool is fastened to the slide of the lathe. The angle of the roller should be 1° to 2° smaller than the angle of the threading tool which cut the thread.

The process of rolling is now similar to threading. Before coming into the thread, the pressure roller is advanced about 0.010 in. Because the point of the roller forces into the core diameter of the thread, the material is pushed away, moving the thread profile outward.

The same procedure can be applied to ball bearing seats on shafts which are turned too small. A thread about 0.010 to 0.020 in. deep is rolled on the part, on the surface which is turned undersize. By so doing, the diameter is upset and must be ground to the correct measure. There remain, of course, small grooves in the work, but such a disadvantage may sometimes be acceptable, if the area is a ball bearing seat or a similar surface.

Anton Fischer, Zurich, Switzerland



Winner No. 241

ALLAN I YOUNG,
Cedar Rapids, Iowa

won $25 in addition to regular payment for his idea:

STRIPPING DEVICE
FOR PIERCING PUNCH

In the issue of Dec 5 '55

An extra payment of $25 is made for the best Practical Idea in each number of *American Machinist*. To avoid bias, the selection will be made by readers, a different group each time.

PAYMENT—$25 in addition to regular rates for the item as published, to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each and every co-winner. Decision of the readers will be final in each case.

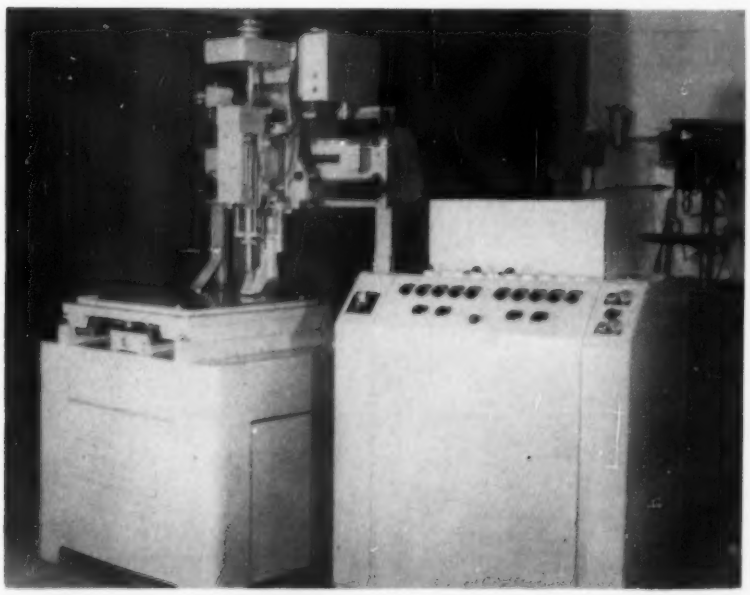
REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER—Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER—Send your entry to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N Y

Tool Show | in print

Descriptions of nearly 200 new products to be introduced at the ASTE Industrial Exposition. All will be on display, along with many others previously described in American Machinist, *at the International Amphitheatre, Chicago, March 19 to 23. Hours are 9 am to 6 pm (Wednesday, March 21, 9 am to 10 pm)*



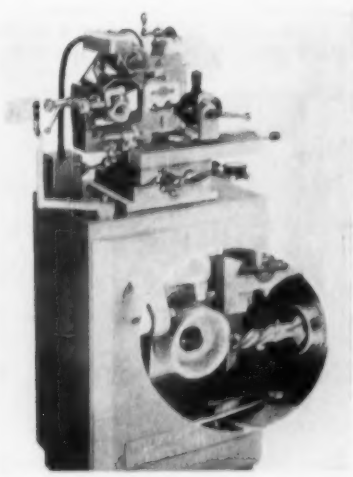
Hillyer Machine Locates and Drills Holes to ½-in. Diameter

Direct numerical input, by means of dials or punched tape, controls Model LD-24 automatic locating and drilling machine, which handles work up to 24 in. in width and any reasonable length. 1-hp automatic drillhead will drill up to ½ in. in templets, panels, printed circuits, and castings.

Operator sets actual length and width dimensions in increments of 0.001 in. on direct numerical dials, and presses direction controls to set machine in motion. Simultaneously the drilling unit automatically moves crosswise to the selected width dimension, while the table moves the work to the length dimension. As soon as selected position is located, drill feed is automatically actuated. If desired, drilling operation can be controlled manually.

Operator loads and unloads work. All required machine functions are signalled and controlled by tape.

Hillyer Instrument Co, Inc, 54 Lafayette St, New York 13, NY **Booth 1200**



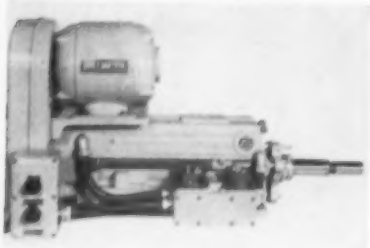
Field End Mill Grinder Accommodates 3-in. Cutter

Centra-Point is name of end mill grinder which features a simplified method for grinding helical curves. Clearance angles can be read directly from calibrations on the wheelhead assembly, without reference to tables of constants. Mechanical wheel dressing by built-in diamond truing tools insures perfect wheel radius for helical grinding.

Machine has max collet capacity of ¾ in., and accommodates cutters up to 3-in. diameter. Indexing mechanism accommodates 1, 2, 3, 4, 6, and 12 teeth. Other specifications: work head swivel scale, 0° to 90°; carriage travel, 4 in.; grinding wheel speed, 6900 rpm; motor, 115-v 1-phase ac or dc.

William H Field, Inc, 325 Dorchester Ave, Boston 27, Mass **Booth 302**

Tool Show | in print

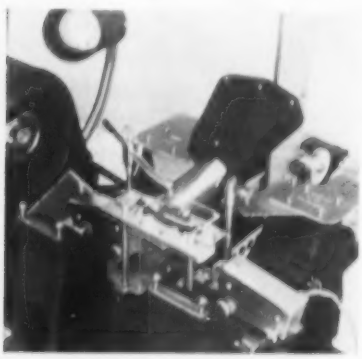


Deep-Hole Drilling Unit

Self-enclosed, hydraulic-feed power unit is introduced by Drillmation. Drilling steps or increments can be preset to any depth multiples and, with a rapid approach and return, need no further adjustments.

There is reportedly no appreciable heat rise due to locked-circuit feed. Unit is said to be capable of drilling millions of holes in alloys up to 40 R_c. Spindle and pumps are integral and in line with drill thrust. Standard models have 10-in. stroke.

Drillmation Co, 21511 John R St, Hazel Park, Mich **Booth 737**



Dynograph Balancing Machine

Model M2-S-40/AA is designed for balancing miniature rotors weighing a small fraction of an ounce. Work-supporting fixture, extremely lightweight, promotes high relative sensitivity for small rotors. This fixture and base assembly may be removed from the balancer as a unit, allowing machine to be converted for balancing other types and sizes of rotors.

When balancing rotors of ¾-in.-dia or less, a fixed binocular light beam scanning arrangement is available. Amplified unbalance signal is passed through an electrical phase-splitting network which causes the unbalance trace to appear as a circle on the scale of the CR tube, the diameter of the circle being proportional to the amount of unbalance. Machine requires 42 in. of bench space, operates from 115 v 60 c.

R B Annis Co, 1101 N Delaware St, Indianapolis 2, Ind **Booth 1214**

Brush Instrument Measures Surface-Finish Roughness

Surfindicator Model BL-110 is a shop instrument designed for the measurement of surface-finish roughness. Range measured extends from 1 to 1000 mu-in. Instrument can be calibrated to read directly in arithmetic average or in RMS mu-in. deviation from the mean surface.

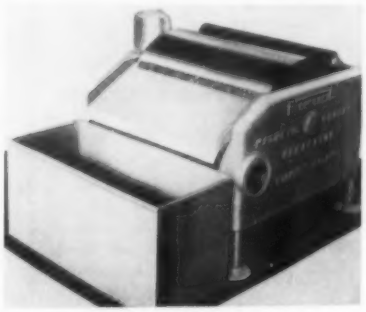
Variable roughness-width cutoff switch permits separation of waviness and roughness characteristics of surfaces by filtering out wave lengths exceeding 0.003, 0.010, or 0.030 in.

Calibration of instrument is obtained through use of company's Cali-Block precision reference specimens.

Instrument was specifically designed for hand use, to eliminate need for special mechanical devices. Pickup head is provided with a handle for hand tracing. Exploring stylus on head has diamond tip which contacts work at pressure of approximately 1 gram.

Case contains indicating meter, amplifier, power supply, and all necessary controls.

Brush Electronics Co, 3405 Perkins Ave, Cleveland 1½, Ohio **Booth 1017**

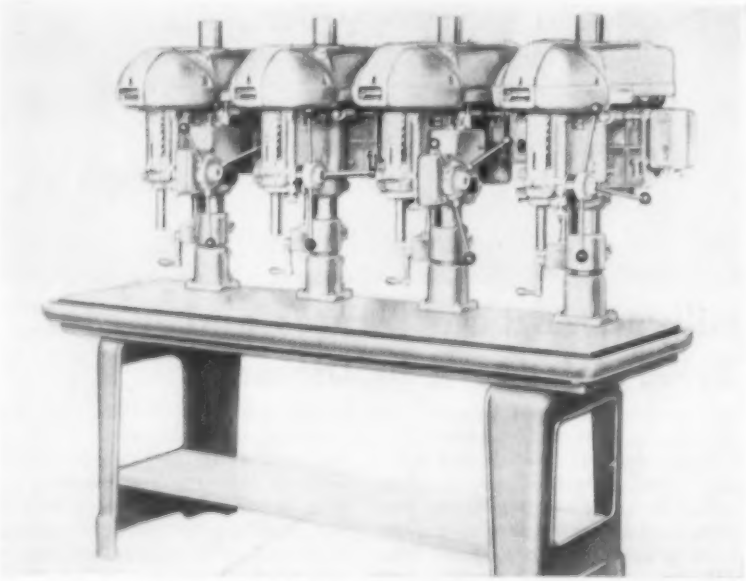


Magnetic Coolant Separator

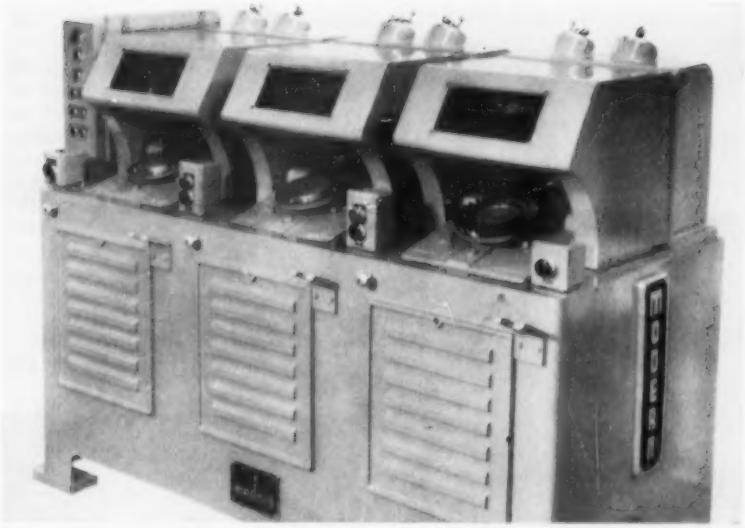
Barnesdril No. 4 magnetic coolant separator is designed to separate ferrous particles and entrained material from coolant.

Design features include large rubber roller and sludge pan for collection of swarf and sludge.

Barnes Drill Co, 830 Chestnut St, St, Rockford, Ill **Booth 1127**



CLAUSING 18-IN. HEAVY-DUTY MULTIPLE SPINDLE DRILLPRESS has larger, heavier table with 84 x 22-in. working surface, greater distance between spindles; drills 1 in. in cast iron, ¾ in. in steel; has No. 3 MT spindle, 6½-in. spindle travel; honed bearings for quill; ball-bearing-equipped spindle; hand feed or gear-driven power feed; cast-iron pulleys—*Clausing Div, Atlas Press Co, Kalamazoo, Mich* **Booth 1418**



3-Station Grinding Machine Chamfers Both Edges of Hypoid Gear Teeth

Three ring gears are chamfered simultaneously on the Modern chamfer grinding machine at rate of 300 per hr. The three stations function independently, but identically to one another, and can be handled by a single operator.

Two air-driven spindles mounting small grinding wheels for the deburring and chamfering operation are located at each work station. Balanced spindles, mounted on anti-friction bearings, are infinitely adjustable so that grinding wheel may be set in proper relation to gear teeth. One grinding wheel chamfers inside diameter, the other, outside. Burrs are removed, and tooth interference is eliminated by means of the chamfer. A chamfer is ground all around the tooth form, including root and toe, with grinding wheel actually being cammed around tooth form by rotation of the work, and the fact that spindles are counterbalanced.

Unit can handle various sizes of parts; a variety of straight and spiral bevel gears can be chamfered by adjustments in the tooling.

Modern Industrial Engineering Co, 14230 Birwood Ave, Detroit 38, Mich

Booth 613

Profilometer for Measurement Of Surface Roughness

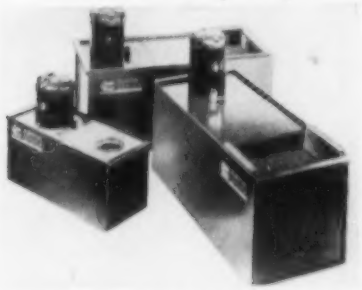
Micrometrical's Group II profilometer is said to measure more than 85% of all surfaces produced by industry. Components are: amplimeter, motorized tracing unit, tracer, linking arm, and roughness specimen for checking instrument's condition.

Type LJ tracer has three interchangeable skidmounts which enable it to measure a wide variety of surfaces. Type V Mototrace provides a smooth, steady tracing motion of 0.3 in. per second over any desired length of trace from 1/16 to 2¾ in. Mototrace and tracer are connected by linkarm which has swivels that allow tracer to follow along IDs, ODs, and tapers.

Type QA amplimeter shows arithmetical or rms average roughness height, as selected by switch on panel. Unit has six ranges: 0 to 3, 10, 100, 300, and 1000 mu-in.

Manual tracing is provided for by use of two of the three interchangeable skidmounts, one for IDs from ½-in. to flat, and one for ODs from ⅜-in. to flat. Both of these skidmounts permit measuring on gear teeth as small as 10 DP.

Micrometrical Mfg Co, 345 S Main St, Ann Arbor, Mich **Booth 774**



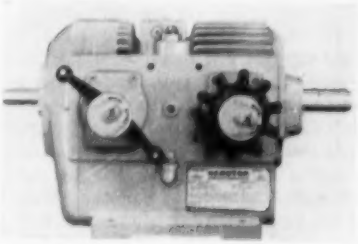
Graymills Coolant Pump Units

Three models have been added to Graymills line of coolant pumping units: ¼-hp centrifugal pumping unit has a ten-gallon baffled tank, and ½-hp and ¾-hp models each have a 38-gal tank.

All models include Superflo centrifugal pumps, which deliver high volume of coolant for peak requirements but may be throttled to a trickle, providing a wide range of coolant flow. All pumps are abrasive proof and can be used on such machines as grinders and mills.

Motors are totally enclosed and NEMA face- or foot-mounted to comply with JIC standards. 38-gal tanks have extra-large chip-collecting trays.

Graymills Corp, 3705 N Lincoln Ave, Chicago 13, Ill **Booth 360**



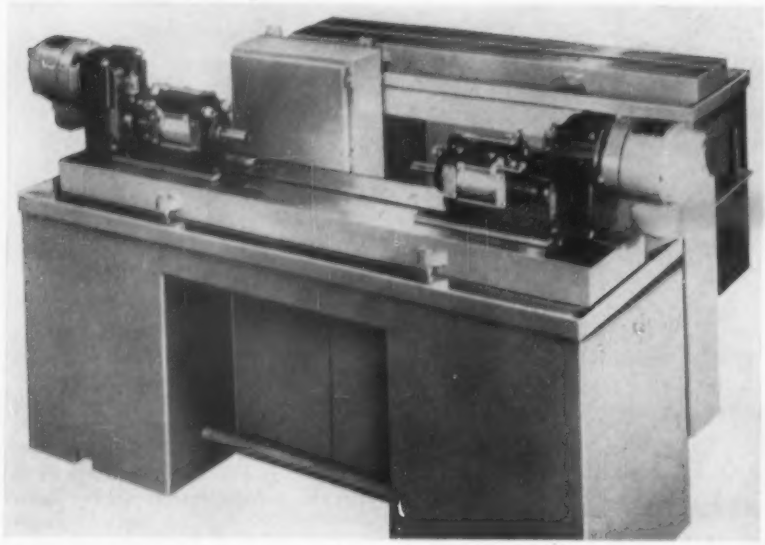
Gerotor Hydraulic Transmission In Variable-Speed Model

Model B variable-speed hydraulic transmission is a self-contained unit consisting of a driven oil pump and an output oil motor. These rotating elements are incorporated in one air-cooled housing which also acts as the six-quart oil reservoir.

Full range of controls is available from hand to automatic remote. Speeds from 0 to 1500 rpm are obtainable in either direction, with either constant or variable torque or horsepower.

Unit develops a maximum torque of 525 in.-lb at output speeds between 60 and 425 rpm. Weight of unit less motor and oil is 324 lb.

Gerotor May Corp, Maryland Ave and Oliver St, Baltimore, Md **Booth 750**



Hause Double-End Machines For Drilling and Tapping

Double-end machines designed to perform operations such as drilling, tapping, and end-cutting tool operations incorporate two Model 24 Holomatic drill units, a steel-weldment base, and air and electric power- and cycle-control systems. All components are mounted, wired, and air-plumbed ready for operation.

Holomatic units are flexible tool-feeding devices using shop air-line pressures for thrust and self-contained sealed hydraulic systems for spindle travel control. Rapid travel movements, feed rates, and stroke lengths are all adjustable in both advance and retract motions. Maximum stroke length per unit is 4 in., and maximum work capacity is 2 hp. Spindle speeds from 190 to 10,000 rpm are available.

Long, wide top of machine base allows positioning of Holomatic units and fixtures for machining holes that are opposed, offset, angular, and up to 35 in. apart. Built-in cycle control systems provide for interlocking with automation devices such as air clamps, index tables, and part feeders.

Hause Engineering, Montpelier, Ohio
Booth 246

Precision Dial Indicator

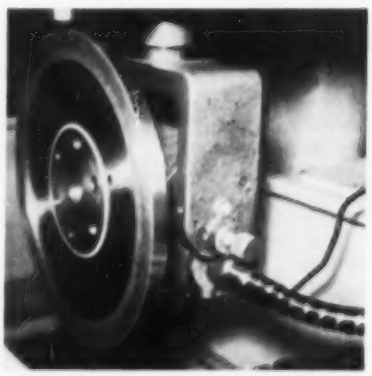
Geneva Dial No. 145F is designed for use with all types of special and production fixtures. Dial is graduated to 0.0001 in. in a balanced dial with a range of 0.060 in. in six revolutions.

Device is adjustable, with a positive internal lock for fine settings. Dial is ½ in. thick, has 2-in. diameter, and features a non-breakable crystal.

Stem has 0.375-in. OD with ⅜-in. bearing for plunger, which is hardened, ground, and draw-finished to 5/32-in. diameter. Case and plunger housing are machined as one piece from solid brass.

Also available in 0.0001-in. graduations is Geneva No. 146F with continuous dial.

Chicago Dial Indicator Co, 180 N Wacker Dr, Chicago 6, Ill
Booth 1030



Uniform Grinding Fixture

Horizontal-vertical grinding attachment chucks directly into the spindle of the standard Elox M-500 electrical discharge machine.

Fixture allows operator to grind in a horizontal plane using a brass wheel which is driven by a motor mounted at the base of the machine, using a flexible shaft. Flexible shaft drive allows freedom in indexing unit from one plane to another. Wheel can be positive-positioned in a horizontal, 45°, or vertical plane by means of an index pin; it can also be indexed at right angles to the table by rotating the unit in the spindle of machine. Fixture can be used for drilling perfectly round holes by revolving an electrode.

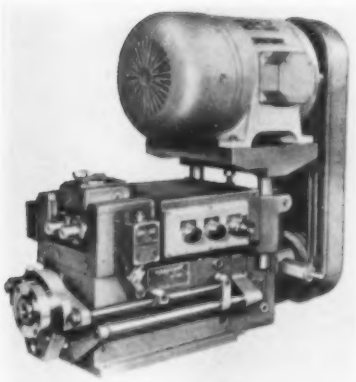
Elox Corp of Michigan, 1830 Stephenson Highway, Royal Oak 3, Mich
Booth 574

Vibratory Feed

Vibrolator is shown operating on a centerless grinder feed trough. Parts move down and into position for pickup by grinder feed wheel, eliminating manual pushing and jackknifing. Vibrational force and speed is infinitely variable by adjustment of needle or globe valve in air supply. Units are available in 52 sizes and models.

Martin Engineering Co, Neponset, Ill
Booth 761

PILOTED AIR VALVES in Beckett-Harcum BVP Series are said to have very fast reaction, positive pressure piloting, and very low current drain. Valves are available with current characteristics from 6 to 900 v, ac or dc, and in all popular frequencies—*Beckett-Harcum Co, 1087 Wayne Rd, Wilmington, Ohio* **Booth 545**



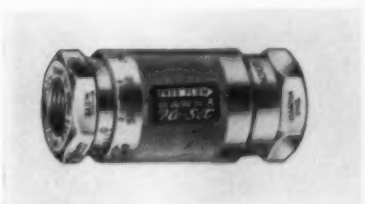
Crescent Power Unit Is Hydraulically Operated

Style Q-9 hydraulic power unit is self-contained, with no optional equipment needed. All electrical controls for manual and remote operations are standard with the unit and are contained in a shielded, dust-proof enclosure. Unit is arranged for motor drive in any degree of 360° in line with pump pulley.

NEMA frame motors range from 1 to 3 hp. Motor speed is 1750 rpm, and maximum thrust is 3100 lb. Other specifications: max spindle travel, 9 in.; range of feed, 1 to 32 ipm; rapid traverse rate, 240 ipm; spindle speeds, 200 to 7000 rpm; net weight (less motor and oil), 395 lb.

Bulletin No. 54.

Crescent Tool & Machine Co, Inc, 1780 Southfield Rd, LIncoln Park, Mich **Booth 144**



Speed-Control Valves

Hanna Flo-Set line of speed-control valves is used for controlling speeds of air and hydraulic cylinders and for regulating the flow of fluids. Valves permit forward-stroke speeds to be adjusted independently of reverse-cylinder strokes.

Aluminum and stainless steel are combined in construction. Valves are rated for 250 psi air and hydraulic service. One revolution of valve body controls flow from zero to full opening.

Hanna Engineering Works, 1765 Elston Ave, Chicago 22, Ill **Booth 366**

Cincinnati Machine for Induction Hardening

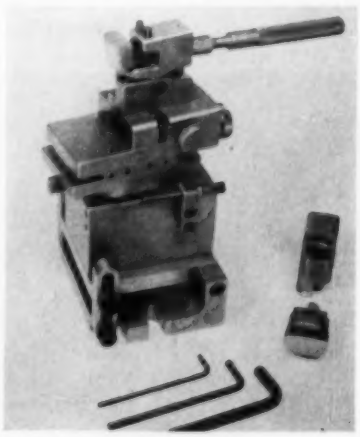
Cincinnati Milling Machine Co induction hardening machine operates at high frequency of 1200 to 1400 kc. Machine is designed for rapidly hardening small parts, thin-walled parts, and work requiring a shallow case and narrow transition zone. Unit can be equipped with automatic work-handling system and set up for automatic operation. Circuit is designed to receive automatic control at a high speed.

If desired, work and oscillator units can be located directly in production line and power supply placed several hundred feet away.

Machine is also reported well-suited for various low-production operations. Initial and replacement coil cost is said to be low. Infinitely variable output transformer can be adjusted to compensate for error between design of coil and actual geometry of part, so that in many cases operator can make a coil simply by bending it around his fingers.

Operator safety is stressed. Machine is so designed that voltage at work coil is at a very low potential. Operator could hold work in the coil and actually touch the coil without being injured.

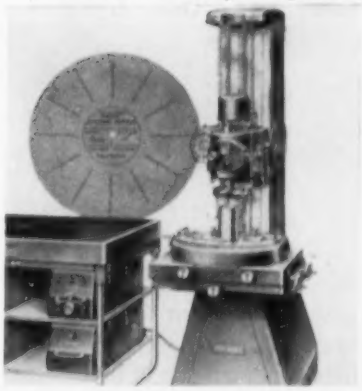
Cincinnati Milling Machine Co, Cincinnati 9, Ohio **Booth 100**



Radius-Grinding Fixture

Apex general-purpose radius-grinding fixture allows for redressing tools. Adapter heads for holding shankless, round shank, or square toolbits are interchangeable on fixture by removing one screw only. Fixture can be used on any tool and cutter grinder that has infeed.

Apex Tool & Cutter Co, Inc, Shelton, Conn **Booth 174**



Talyrond Measuring Instrument

Electronic machine measures roundness of parts. Radial magnification is variable from 50 to 10,000, depending on depth below top of work. With the part to be tested held stationary, the instrument's ultra-precision spindle holding stylus and pickup produces a permanent record.

Engis Equipment Co, 431 S Dearborn St, Chicago 5, Ill **Booth 1020**

PERMANENT MAGNET CHUCKS, lighter, lower, with increased magnetic surface and holding power have been introduced in two rectangular models, 5 x 10 in. and 6 x 18 in.—*Brown & Sharpe Mfg Co, Providence 1, RI* **Booth 374**

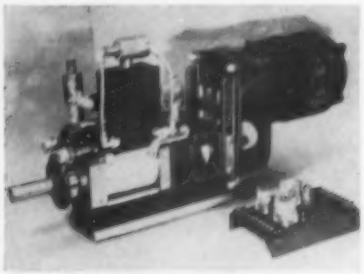
H-W Concentricity Attachment For Thread Comparators

Hanson-Whitney concentricity attachment is designed for use with company's external and internal thread comparators. Device makes possible fast, visual gaging of thread diameter in relationship with face, outside diameter, and bevel of workpiece.

Gaging is achieved by rotation of work against attachment, causing dial indicators to show the concentricity or amount of error between the PD of the thread and related surfaces. Because this is accomplished while the thread diameter is being gaged, separate checking of the work is eliminated.

Hanson-Whitney Co, Div of Whitney Chain Co, Hartford, Conn **Booth 163**

Tool Show | in print



Hause Attachment for Deep Hole Drilling

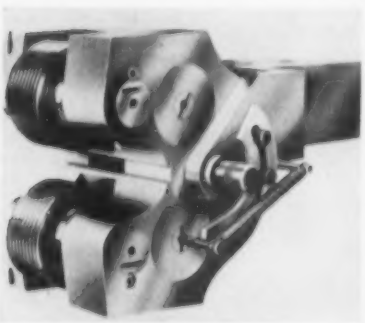
No. F222C deep-hole drilling attachment is designed for use with Model 24 Holomatic drill units. Attachment can be installed on new units or obtained as a kit for field installation on existing units.

Holes from approximately 0.025 in. to ⅝ in. in diameter can be drilled in mild steel up to 3¾ in. deep. Hydraulic control of spindle travel in both rapid and feed movements allows drilling of work-hardening materials such as stainless steel as well as soft materials like copper.

Length of rapid travel on first advance stroke, feed rate, over-all stroke length, and number of withdrawals per completed hole are all adjustable. Drill advancement per step is a function of feed rate and time; time is adjustable from 0 to 9 sec and is established by an electronic timer, available for panel mounting or furnished complete with its own enclosure.

Deep-hole attachment can be disconnected, without removal, for regular operation of the Holomatic unit.

Hause Engineering, Montpelier, Ohio
Booth 246



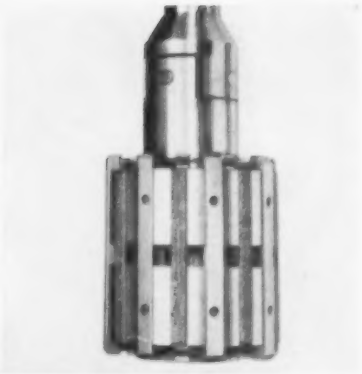
Thread-Rolling Attachment Adapted for Tapered Threading

Lanroll attachment has been adapted for rolling of taper pipe threads including dry seal. Either straight or taper threads can now be produced with the same attachment through the use of proper thread-roll equipment and choice of right thread rolls.

To produce the taper, rolls are supported on carbide shafts inclined to the taper of the thread. Roll threads are parallel to roll axis, thus have a constant helix. This feature is said to provide attachment stabilization to permit rolling directly to a shoulder with safety. In addition, slippage between rolls and work is reduced.

Landis Machine Co, Waynesboro, Penna
Booth 578

HI-FREQUENCY WHEELHEADS, designated Series 800, are made by Bryant for use in computers. Company also has developed magnetic drums in same series for the same purpose—*Bryant Chucking Grinder Co, Springfield, Vt*
Booth 901



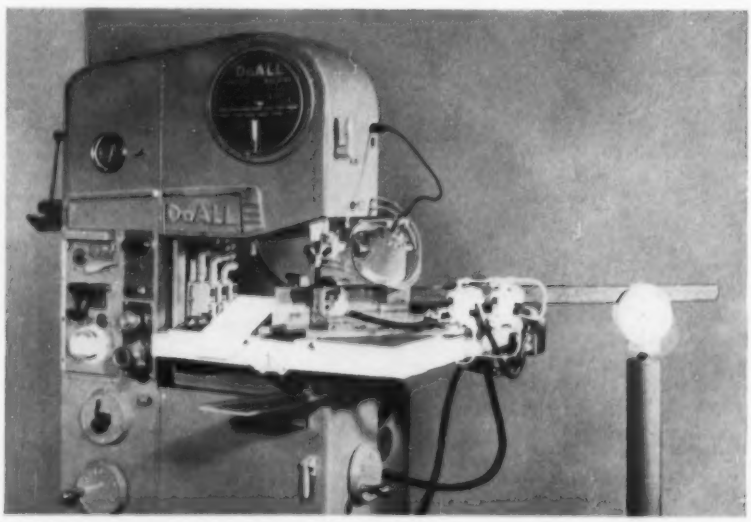
Barnes Honing Tools Have Mounted Stone Insertions

Line of slotted-body honing tools called High Production includes Model HS-5 for small and medium bores and Model HF-8 (illustrated) for medium and large-size bores. Plas-T-Clad abrasive stones used in tools are supported on the sides by the tool body.

Design enables use of a high percentage of full depth of honing stone. Side support is stationary, and expansion support moves as the stone is expended.

Protective material covers sides of stone to prevent spalling. Removal of expended stones and insertion of new reportedly can be accomplished in seconds.

Barnes Drill Co, 830 Chestnut St, Rockford, Ill
Booth 1127



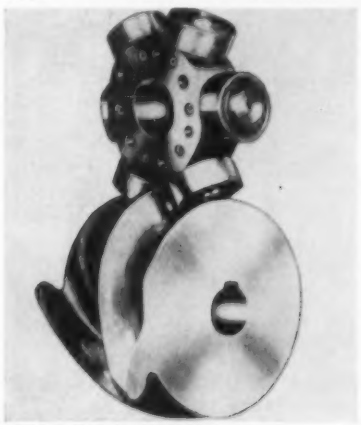
ANGLE SAWING OF STACKED BAR STOCK is accomplished on DoALL 16-3 Contour-matic band machine. In this automatic operation the stacks are indexed, the hydraulic feed table moves forward on the cutting stroke, and the cut pieces are automatically ejected—*DoALL Co, 254 N Laurel Ave, Des Plaines, Ill*
Booth 1520

Universal Measuring Machine

Features of this machine are capacity for larger work, choice of electronic indicator supported on an accurate, rotatable spindle, or a universal microscope for pickup, and a combination of rectilinear and angular positioning, making possible the measurement of the most complex contours. Work capacity is 11 x 18 x 12-in. height.

In positioning accuracy, longitudinal travel, maximum error in any one inch is 10 millionths; maximum error, entire 18 in., 30 millionths. Dial graduation, 500 lines, 0.003 wide; repeatability settings, 5 millionths.

Moore Special Tool Co, Bridgeport 7, Conn **Booth 1430**



Cam Indexing Mechanism

Ferguson Drive is designation for line of cam indexing mechanisms for production machinery employing intermittent motion. Drive consists of a hardened and ground cam with a tapered rib and a hub with preloaded ball-bearing followers. Special configuration of cam rib results in a mechanism with modified trapezoid-acceleration characteristics.

With forces applied gradually, vibrations are held to a minimum and indexing speeds as high as 1000 pieces per minute are reported possible. Used in dial feeds, roll feeds, carrier and chain operations, and other types of angular or lineal intermittent motions, drive achieves a precision of 0.001 in. and zero backlash without lock pins.

More than 75 different drives have been cataloged as standard items.

Ferguson Machine & Tool Co, Roller Gear Div, Box 5841, St Louis 21, Mo. **Booth 350**

Enclosed, Fan-Cooled Motor

Century 5-hp fan-cooled motor is totally enclosed, recommended for use in contaminated atmosphere that could damage ordinary open motor.

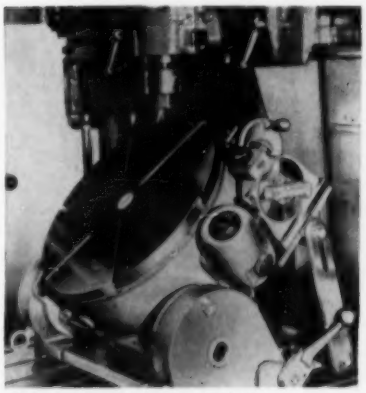
Motor is designed to meet all NEMA requirements. Ventilating fan provides operation in either direction without having to change fan. Unit features aluminum rotor and stator windings incorporating thermosetting varnish and plastic-coated wire.

Century Electric Co, 1806 Pine St, St Louis, Mo **Booth 252**

Gear Gaging and Sorting Machine

Automatic Model GRD checks parts to tenths of a thousandth accuracy, sorts them according to undersize, oversize, or correct specifications, and shuts down a gear production machine if more than a given number of rejects of a specific type are successively produced.

National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich **Booth 816**

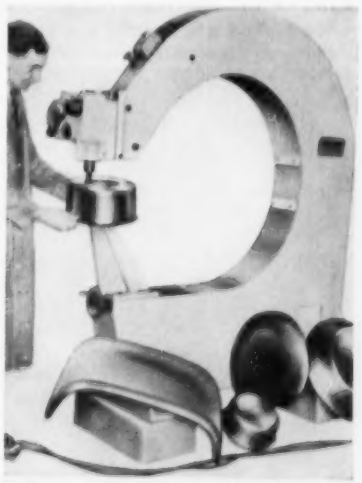


Microptic Circular Table

Sealed projection unit is built into the table. Optical micrometer breaks down the ten minute divisions on the main glass circle into 200 parts to give direct reading to 3 sec; estimation can be made to 1½ sec.

Top surface of the table is flat and parallel to the base within 0.0003. Provisions are available for mounting to an inclinable table for which inclinations are controlled by a Microptic Precision Clinometer reading directly to 10 sec with estimation to 3 sec.

Engis Equipment Co, 431 S Dearborn St, Chicago 5, Ill **Booth 1020**



Trimmer Has Pneumatic Head

Pneumatically operated head can be raised 2 in. for easy insertion of bulky material. Remote foot pedal permits raising and lowering the head to engage and disengage cutting tools.

Unit is equipped with guide bars that can be detached when edge trimming a large stamping or center cutting a deep-drawn stamping.

American Pullmax Co, 2455 N Sheffield Ave, Chicago 14, Ill **Booth 689**

Tool Show | in print

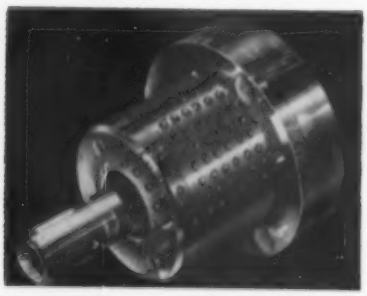
Brush Instrument Measures Variations in Metal

Model BL-140 metal indicator is a shop instrument for non-destructive testing of a variety of metal variations. Device works on a thermoelectric principle; variations in composition, hardness, grain size, plating thickness, or adhesion may be determined between samples or on a single piece.

General-purpose pickup is designed for hand operation, and is detachable to allow use of accessory pickups for examination of very large or very small pieces of any shape. Firm electrical contact between pickup and sample is all that is required to obtain a reading.

Case contains indicating meter, amplifier, power supply, and all necessary controls. Hinged cover is fitted to house the various probe electrodes.

Brush Electronics Co, 3405 Perkins Ave, Cleveland 14, Ohio **Booth 1017**



Size-Positive Boring Quills

Line of standard units incorporates Briney design principle which consists of a bushing mounted on preloaded ball bearings between flange and boring bar. Hole in bushing is eccentric with its outside diameter.

Boring bar is driven by flange which is locked to the bar by an integral pin and locknut unit. Inertia and spring tension on bushing prevent slippage when starting or stopping the quill. Rapid tool adjustment without loosening or tightening any part is accomplished by rotating the bushing with spanner wrench. Adjusting control is provided by graduating the outer surface of the bushing in increments of 1/10,000 in. or larger. Usual range of adjustment is 0.006 or 0.012 in. on the diameter.

Briney Manufacturing Co, PO Box 2208, Pontiac, Mich. **Booth 159**

Universal Attachment for Drills, Turret Lathes

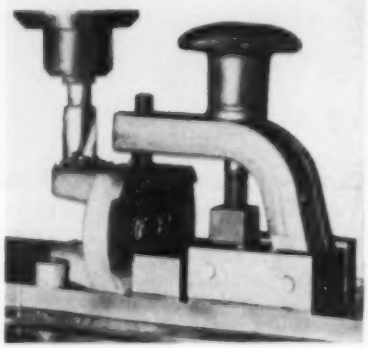
Jay-Dee universal attachment is a combination quick-change chuck and torque tap driver designed for use with turret lathe or drilling machine. Tapping torque is automatically predetermined for tapping according to type and size of tap. Attachment can be used in connection with drilling, reaming, tapping, front- and backfacing, recessing, boring, studding, and set-pin driving and extracting operations.

For working on different materials, only adjustment consists in turning main sleeve through a small arc to the appropriate position between the indexed high- and low-pressure stations. Same tap adaptors are used for all metals.

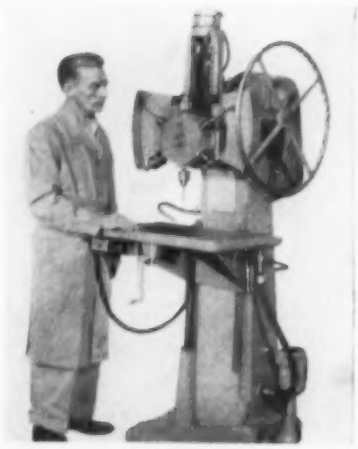
Five models accommodate various Morse taper shanks and are supplied with a variety of tap adaptors for the range of tap capacities.

Other advantages, as reported by distributor: short body lengths, virtually no working parts to go wrong, split-second tool change, and no springs or ball races to wear out.

Distributed by Federal Machinery Sales Co, 4639 Washington Blvd, Chicago 44, Ill **Booth 392**



RETRACTING CLAMPS are furnished both air and hand-operated, in four sizes of four styles—*Lodding, Inc, Worcester, Mass* **Booth 735**

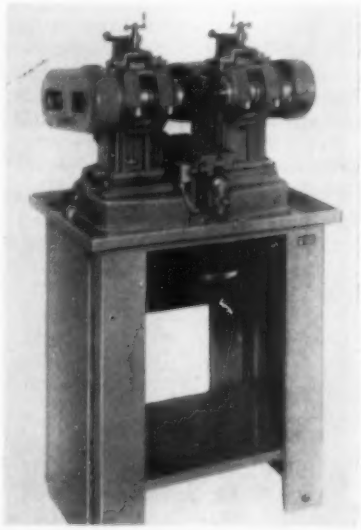


Small, Fast Turret Drill

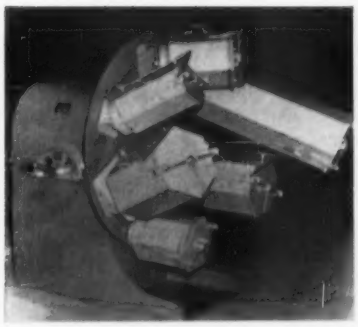
Burgmaster 1C handles holes up to ⅝ in. in steel, has a 7-in. stroke, and speed range of 325-4050 rpm.

Unit has fast power indexing, sensitive feed, preselective speeds and stops, ability to perform any combination of six operations in one setup.

Burg Tool Manufacturing Co, Gardena, Calif **Booth 389**



BENCH MILLING MACHINE called Dual-Mill is addition to Barker line. Machine is equipped with two ball-bearing, heavy-duty, totally enclosed 1/3-hp motors. Variable-speed drive makes it possible to run either spindle at different speeds to accommodate proper cutter for milling operation desired. Another machine (not shown) added to line is Model AM, a 3/4-hp heavy-duty mill which weighs approximately 500 lb. Both machines are furnished complete with pedestal—*Barker Engineering Co, 500 Green Rd, Cleveland 14, Ohio* **Booth 731**



Tumbling Machine Holds Up to 25 Barrels

BMT SlideHoning machine is tumbling unit with controlled-motion honing that reportedly does not affect dimensional tolerances of parts yet removes burrs, flash, tool marks, rust, paint, plating, and heat-treating scale.

Up to 25 barrels can be mounted on the unit, and a range of mountings, barrel sizes, linings, and shapes is available.

Machine has a power chain drive with variable speed of from 11 to 28 rpm. Machine itself requires a space of only 4 x 4 ft.

BMT Manufacturing Corp, 110-112 E 9th St, Elmira, NY **Booth 452**

Conversion Unit for Metal Disintegrators

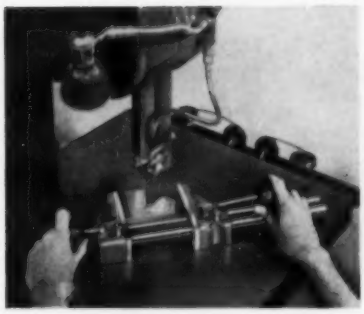
Electro-Arc Co conversion kit reportedly can be adapted to any metal disintegrator in less than 15 minutes, leaving the machine it is connected to intact. Device consists of synchronizing unit, Model SH disintegrating head, 9-in. automatic gravity feed, eccentric-cam impulse pump, and a coolant system if required.

Synchronizing unit contains a 110-v step-down transformer which supplies power used to vibrate the solenoid of the disintegrating head. Head is designed to work with transformer so as to draw the arc only on the positive peak of the sine wave, where optimum cutting efficiency is obtained.

Gravity feed with 4-in. quill feed is counterbalanced by a motor spring which controls rate of travel. Optical coolant system delivers 99 gal per hr at 100 psi, and is connected to a 7-gal tank.

Also offered as optional equipment is a radial cross arm and swivel clamp assembly; cross arm can be rotated 360° vertically and horizontally, making it possible to obtain any compound angle.

Electro-Arc Mfg Co, PO Box 448, Ann Arbor, Mich **Booth 937**

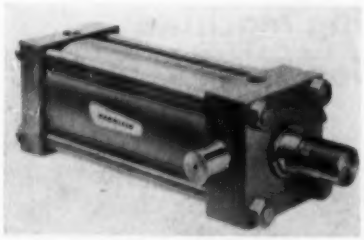


Heinrich Bandsaw Vise Has 12½-in. Capacity

No. 12WH bandsaw vise can be set instantly by sliding movable jaw into position. Device has capacity of 12½ in.; work is locked by a light press of the locking lever.

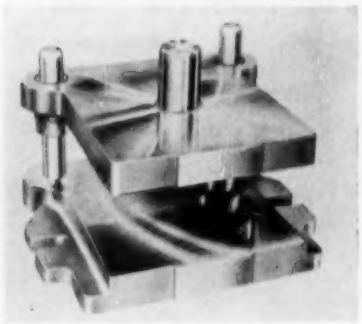
Bar and locking mechanism are hardened and ground steel. Soft, cold-rolled guide bar prevents damage to saw blades. Removable shoulder screws are provided for automatic chain-feed operation.

Heinrich Tools, Inc, 1536 Clark St, Racine, Wisc **Booth 788**



SQUARE STEEL - HEAD HYDRAULIC CYLINDER in Hannifin Series H line is rated at 2000 psi (3000 psi non-shock) and is designed to meet JIC hydraulic recommendations. Design features an externally removable and replaceable bronze cartridge gland. Primary and secondary seals are reported to afford completely dry rod on the out-stroke. Company also offers similar line of air cylinders, Series A, rated at 200 psi for either air or oil—*Hannifin Corp, Des Plaines, Ill* **Booth 158**

TRI-CAL UNIVERSAL VERNIER CALIPER takes outside, inside, or depth measurements directly to thousandths of an inch—*Brown & Sharpe Mfg Co, Providence 1, RI* **Booth 374**



Precision Die Sets

Danly "Leadership Line" die sets have precision-lapped, chrome-plated guide posts, with demountable bushings available as optional feature. All four working surfaces, including top of punching holder and bottom of die holder, are ground to high finish.

Line meets all new ASA standards; in addition are available in broad range of sizes not listed by ASA.

Unit is integral welded at shank for greater strength. Extra length of one guide post provides easier disassembly for die work. All bushings have figure-8 oil grooves for distributing oil film between guide posts and bushing surfaces.

Danly Machine Specialties, Inc, 221 N LaSalle St, Chicago 50, Ill **Booth 596**

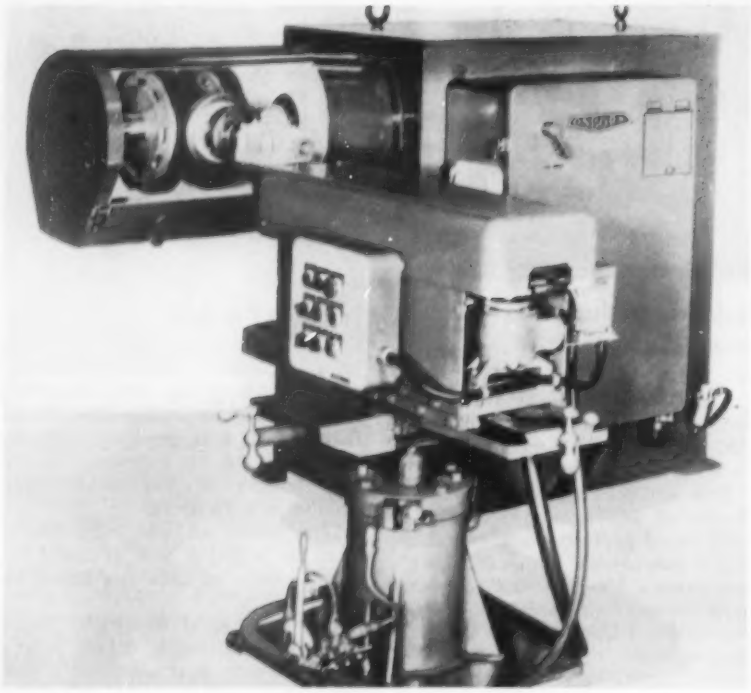
Press Brake Has Stroke Control

Model 18-48 is a 12-ton hydraulically operated unit with 48-in. length of bed and ram.

Most practical length of stroke for each job can be preset. The shorter the length of stroke, the greater the production efficiency, and the more safety to the operator, according to manufacturer.

O'Neil-Irwin Manufacturing Co, 512 Eighth Ave, Lake City, Minn **Booth 1000**

Tool Show | in print

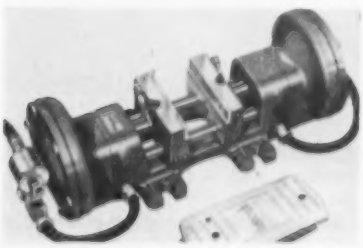


Osborn Power Brushing Machine Finishes Parts of Varied Sizes

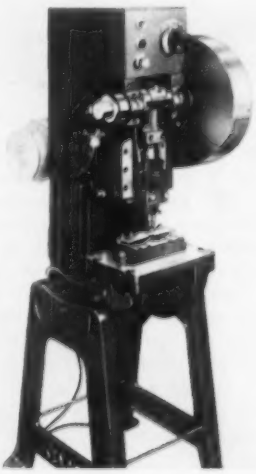
Semi-automatic Brushamatic 3A for removing burrs, blending surface junctures, and finishing parts in a wide variety of work sizes and weights, is designed for production-line operation.

Operator simply loads and unloads the unit; all other operations can be predetermined and are preset. Feeding and retraction of the workholder and rotation of the brushes is automatically controlled on preset cycle.

Osborn Manufacturing Co, Hamilton & Marquette Sts, Cleveland 14, Ohio
Booth 466



SELF-CENTERING AIR VISE, Model 22, is addition to Heinrich line. Device is designed for holding parts varying in size or shape when the work requires the location of a center or other predetermined point—*Heinrich Tools, Inc, 1536 Clark St, Racine, Wis* **Booth 788**

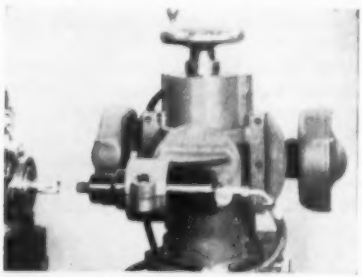


Kenco 15-ton Punch Press Has New Safety Features

Operator must depress two widely-spaced buttons simultaneously to single-trip the Electro-Safe press. Flywheel is eliminated. In single-stroke operation, press and motor go dead after the stroke, eliminating stored-energy, double-tripping hazards. Selector switch, which sets unit for single-trip, continuous, or inching, is locked in position so that operator cannot endanger himself by varying the setting. Absence of standard clutching operation eliminates loud noise and hazard of mechanical clutching. Machine is equipped with heavy-duty safety brake and safety stop button.

Cam action and limit switch permit starting and stopping the crankshaft with the throw in any desired position before or after top-dead-center. Unit can single-stroke up to 60 times per minute. Recommended continuous operating speeds, which may be obtained by changing ratio of motor speed to final drive, run from 20 to 200 spm.

Kenco Manufacturing Co, 5211 Telegraph Rd, Los Angeles 22, Calif
Booth 618



Grinding Attachment

Internal grinding attachment has been designed for the R-O Universal Form Relieving Fixture.

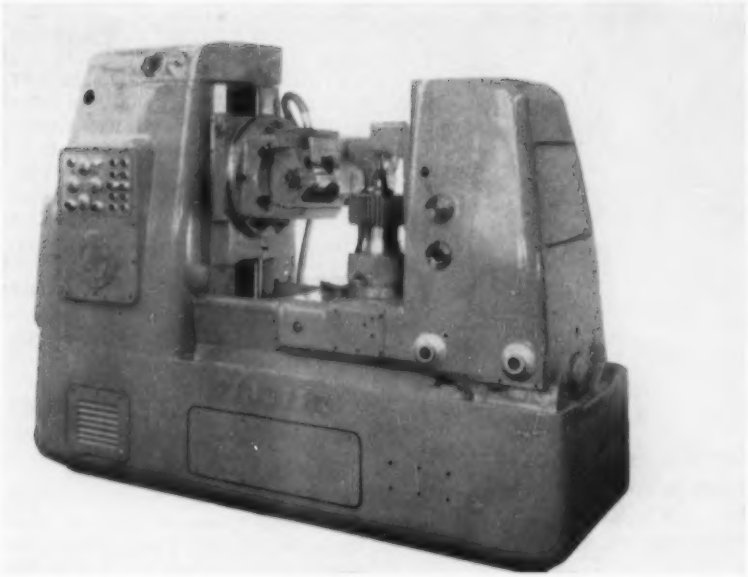
Device consists of a precision Vulcanaire 65,000-rpm air spindle with Norgren filter and pressure regulator, and utilizes shop air power. Can be positioned at any angle with easily read machined markings, and can be raised or lowered by hand wheel. Unit mounts on reverse side of the grinder column so that it does not interfere when grinder is being used on conventional operations. By swinging column counter-clockwise 90°, the internal grinding wheel can be brought into the side of the work; by swinging 180° clockwise, it can be brought into end of work.

Royal Oak Tool Machine Co, 29800 Stephenson Highway, Royal Oak, Mich
Booth 278

Rivet-Setting Machine

Model 250, with newly designed toggle-setting action, is furnished with quick-change hopper feed mechanism, Horton-type roller clutch, and electric motor drive. Unit handles a maximum rivet range of 3/16 shank diameter by ¾-in. length; has 12-in. throat depth; can be used with full tubular, semi-tubular, or split rivets.

Milford Rivet & Machine Co, Milford, Conn
Booth 453



Pfauter Gear Hobber In High-Speed Model

Model P-500 universal gear hobbing machine is German machine designed for high-speed hobbing: standard speed range is 60 to 380 rpm, but speeds up to 560 rpm are available. Dials at the operating panel control hob speeds and all feeds, eliminating change gears. Remaining change gears for indexing and for differential are grouped in one box.

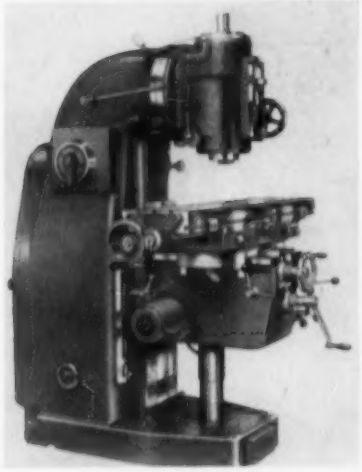
Universal hob head is provided for tangential hobbing and for automatic shifting; worm gears can be hobbed tangentially without changing heads. Automatic work cycle consists of rapid approach until hob touches work, plunge cut until tooth depth is reached, automatic changeover to longitudinal cut, then longitudinal cut. When cut is completed both hob and work return to starting position in rapid traverse.

Machine has 20-in. capacity, maximum pitch in steel is 3 DP, and maximum face width is 15¾ in. Weight is 11,000 lb, and unit occupies a floor space of 100 x 51 in. Machine is available in another model, No. P-900, which has a 36-in. capacity.

Other features: diagonal hobbing, eliminating special hob shifting attachments; heavy work arbor support column, eliminating overarm; hydraulic backlash eliminator; hydraulic automatic loading fixtures; dual lead worm gear drives for table and hob spindle.

Imported by Pfauter Machine Co, 3206 Fairfield Ave, Riverdale, NY

Booth 336



Swedish Vertical Miller

Sajo No. 2 Model VF-54 vertical miller comes equipped with main drive and table feed motors and magnetic controls fully wired and ready to run. Spindle drive is by a 7½-hp motor, and table feeds are powered by a separate 1½-hp motor.

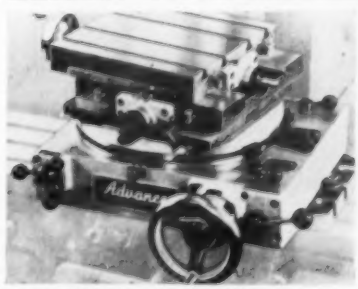
Working surface of table is 47¼x 11 in. Table feeds in all three directions are available by hand or by power; 12 power feed rates are controlled by a capstan and direct-reading dial on the front of the knee.

Hardened chrome-nickel steel spindle has an American standard No. 50 milling machine taper. Twelve spindle speeds are selected by direct-reading dial and single crank in a range from 39 to 1500 rpm. Spindle is mounted in SKF precision staggered roller bearings combined with SKF thrust ball bearings. Spindle head can be swiveled 45° left or right from the vertical.

Other features are single-lever start-stop brake, quill-clamping and built-in coolant system.

Imported by Austin Industrial Corp, 76 Mamaroneck Ave, White Plains, NY

Booth 550



Cross-Slide Rotary Table For Vertical Millers

Morrison "Advance" cross-slide rotary table is designed for fast, accurate positioning of work from one location to another. Unclamping, relocating, and reclamping are reported unnecessary.

Device is made for use on all vertical milling machines and is designed to withstand maximum cuts which would ordinarily vibrate the heads of these machines.

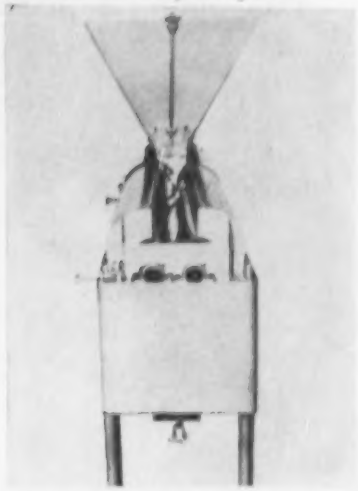
Accuracy is reported obtainable to ±1 min on the rotary table and 0.0005 in. on the cross-slide. Accessories available include indexing attachment and universal profiling table.

Morrison Engineering Co, 941 W Lake St, Chicago, Ill **Booth 332**

BENCH CENTERS *are available in small sizes for use where work does not exceed 18 in. in length—Brown & Sharpe Mfg Co, Providence 1, RI*

Booth 374

Tool Show | in print



Esbec Dimensional Separator Has Adjustable Controls

Designed for use in separating processed parts from tumbling media, powered by a 110-v, single-phase, ¼-hp. motor. Separations are made according to the critical dimensions of parts or chips: thinner, flatter pieces drop through rolls, while thicker pieces are discharged at the end of the rolls.

Four micrometer-type controls adjust for changes in size of material, hopper discharge, rate of feed, and rate of discharge. Three-speed drive increases flexibility of operation.

Typical operations include separation of needles from steel balls, ferrous parts from ferrous media, flat parts from round ones, non-ferrous parts from chips of the same general size, and thin flat shapes from thick pieces of the same length and width.

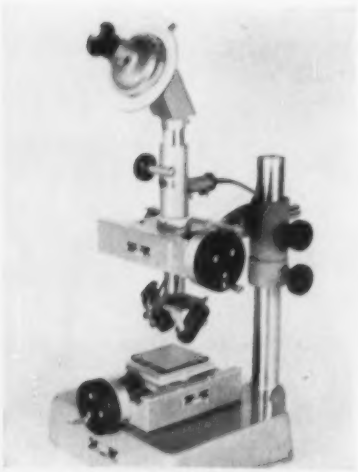
Esbec Barrel Finishing Corp, 18 Beech St, Byram, Conn **Booth 768**

Tooling Material

Pioneer 921-T is a specially alloyed cast aluminum. Advantages claimed are light weight, 1/3 that of steel; 100% stability, no distortion from heating or welding, maintains flatness; longer life; high machinability, maintains tolerances; free from porosity and casting defects; high degree of surface finish; and high tensile strength relative to its weight.

Octopus Grip vacuum chuck, fabricated from this material, is designed for use in milling of complex shapes. 921-T will expand and contract at same rate of material being milled.

Pioneer Tool Engineering, Inc, 1601 E El Segundo Blvd, El Segundo, Calif **Booth 1235**



Coordinate-Measuring Microscope Reads to Nearest 0.0001 in.

Gaertner Model M1235A coordinate-measuring microscope is designed primarily for precise measurement of small piece parts.

Measurements can be made to 0.0001 in. in two dimensions up to coordinate range of 4 x 4 in.

Variety of accessory items is available, including eyepieces and attachment for permitting angular measurements to 3 min of arc.

Gaertner Scientific Corp, 1201 Wrightwood Ave, Chicago 14, Ill **Booth 1126**

Standard Die Blanks

Ampco Metal Grade 24 blanks are available in a variety of shapes and sizes.

Centrifugally cast rings include 27 sizes from 4 to 20-in. OD, 1 to 12½-in. ID, and 1½ to 3½-in. thicknesses; solid rounds in 11 sizes from 1 to 5-in.-dia in standard lengths of 12½ in. (except 3, 3½, and 4-in. can be supplied in 6-in. lengths; standard length of 5-in.-dia is 6 in). Rectangles are offered in 36 sizes, ½ to 4-in. thicknesses, 1 to 4-in. widths, and 12½-in. lengths, except in six instances where duplicate sizes can be supplied in 6-in. lengths.

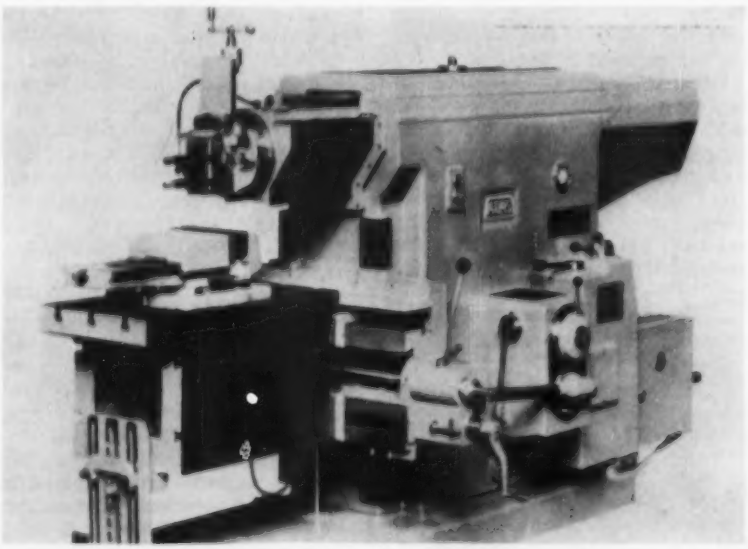
Ampco Metal, Inc, 1745 S 38th St, Milwaukee 46, Wis **Booth 204**

Tumbling Machine

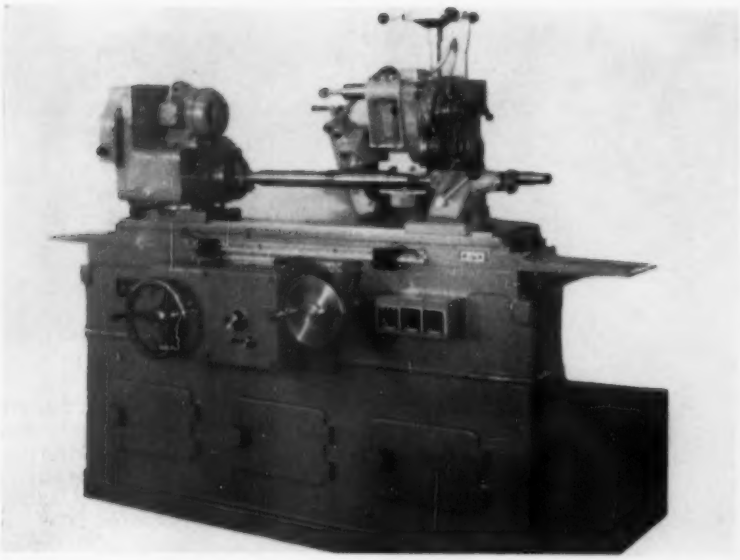
Esbec Model 2430 is smaller version of company's standard HD line. Unit has a two-compartment drum, each compartment measuring 24 in. across octagon flats by 15 in. wide, so that each compartment has a total capacity of 4 cu. ft.

Model is offered in two different forms, one for standard abrasive tumbling and a heavy-duty model for ball burnishing and zinc or steel slug tumbling.

Esbec Barrel Finishing Corp, 18 Beech St, Byram, Conn **Booth 768**



HEAVY-DUTY SHAPER, Schlenker Model V-800, is West German machine featuring heavy V-shaped ram which slides in plastic guides. Wear on V-ram is said to be minimized, and V shape of cross-section eliminates play. Machine has max stroke of 33½ in. and the table a cross feed of 31½ in. 18 ram speeds allow adjustment of 6 to 108 strokes per min. Machine table is equipped with vertical and horizontal rapid traverse—*Imported by Eric R Bachmann Co, Inc, 27-11 41st Ave, Long Island City 1, NY* **Booth 1301**



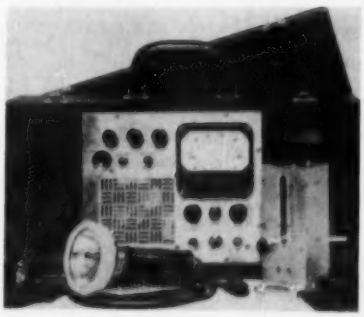
Universal Grinding Machine In Canadian Model

Barer universal grinding machine, Model L/B-75-R, has body of cast-iron box-type construction. Platen which carries both head and tailstock is fitted on upper part of table and can swivel 4° each way for taper grinding. Power traverse to table is hydraulically operated; table speeds are infinitely variable within range of 4 to 240 ipm. Tarry control at each reversal of table is provided.

Workhead, which swivels up to 90°, has a hardened, ground, and lapped steel-alloy spindle which has a ⅞-in. bore for collets. Wheelhead has a swiveling movement in the vertical plane up to 45°.

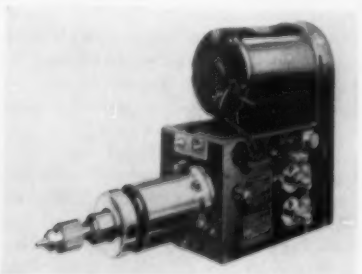
Other specifications: distance between centers, 30 in.; max swing, 9½ in.; grinding length, 30 in.; length of table, 47 in.; floor space of machine, 120 x 50 in.

Barer Engineering & Machinery Co, Ltd, 1248 Notre Dame St W, Montreal 3, Canada **Booth 1424**



PORTABLE BALANCING MACHINE called Vibrodyne features tunable pick-ups. Unit is designed for in-place balancing of parts rotating between 250 and 3600 rpm. Housed in a carrying case, unit weighs only 36 lb—*Tinius Olsen Testing Machine Co, Willow Grove, Penna* **Booth 566**

PORTABLE ALIGNMENT INTERFEROMETER measures to 0.000003 in., and/or 0.1 second of arc—*Bausch & Lomb Optical Co, Rochester 2, NY* **Booth 1032**



Automatic Unit Drills and Taps

Most drilling and tapping operations can be done with the same setup on the Drill 'n' Tap by removing drill bushings when tapping. No special tapping attachment is necessary; tap-like drill is inserted directly into ⅜-in. capacity Jacobs 11A ball-bearing chuck. Motor, controlled by panel, automatically reverses at preset depth to withdraw tap, then reverses again at top of stroke for right rotation.

Drill capacity is up to ⅜ in. in 1020 steel; tapping range in either LH or RH threads is from 2-56 to ½-13 in 1020, or up to ¼-in. pipe tap.

The Dumore Co, 1300 Seventeenth St, Racine, Wis **Booth 678**

Ellis Dividing Head

Unit, available in either plain or double-swivel type, swings 6½ in., or 11 in. with riser blocks. Indexing accuracy is guaranteed to one minute in 360° rotation. Spindle run-out is 0.0004 in. or less, measured at end of 12-in. mandrel. Most divisions up to 520 are obtainable.

Extra equipment available includes self-centering chucks, face plates, draw-in collet attachment to ¾-in. capacity.

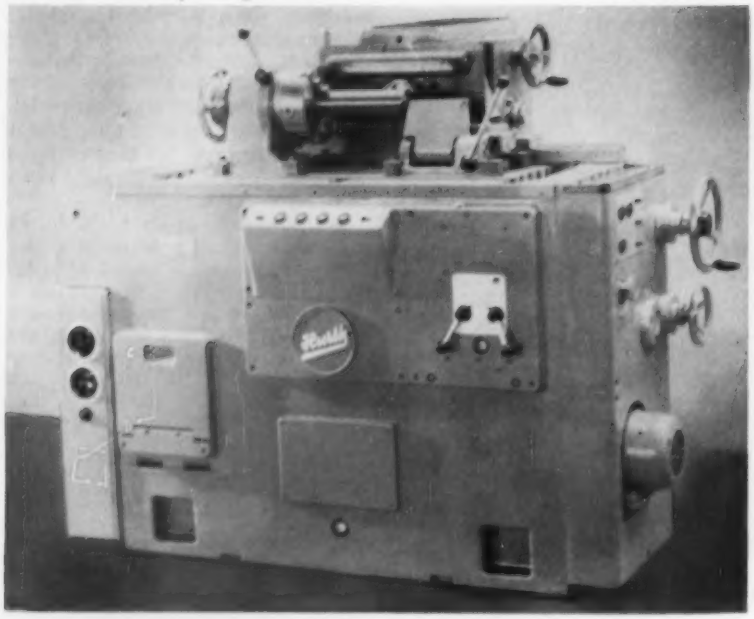
Nichols-Morris Corp, 76 Mamaroneck Ave, PO Box 430, White Plains, NY **Booth 351**

Epoxy Laminating Resin

Epocast 2-D is designation for Furane greyish-colored epoxy laminating resin. Material is reported to have excellent wetting properties and to have ability to cling on vertical surfaces.

In use, resin is mixed with hardening agent before application. Material will cure tack-free in 3 to 4 hours and overnight at 80 F. Manufacturer recommends that trial samples be evaluated before production applications of epoxy resins in order to familiarize personnel with curing and handling properties of the material.

Furane Plastics, 4516 Brazil St, Los Angeles 39, Calif **Booth 165**



German Keyway Miller Has Automatic Operating Cycle

Hurth keyway miller, Automat LF32, has fully automatic operation, requiring only hand loading and unloading of work. At press of start button, spindle begins rotating and spindle sleeve moves toward work in rapid traverse.

Milling time on a keyway ⅝ x 2 x ¼ in. is approximately 1 min. At end of milling cycle, machine stops automatically.

Large scales simplify setting length, width, and depth of keyways or slots to be milled. Twelve spindle speeds, from 180 to 2240 rpm, and 12 longitudinal feeds are provided.

Worktable is stationary and is an integral part of machine base. Normal length of table is 49½ in., but can be increased to 70 or 88 in. to accommodate longer workpieces. Length of milling stroke cannot be increased.

All movements are performed by the cutter slide. Rocker arm mounted in three bearings raises and lowers cutter slide according to width of adjustment of the keyway. Operation is hydraulic against limit stops, with a set-up accuracy of 0.0002 in. Gear drives are controlled by electromagnetic clutches for the individual operations.

Imported by Kurt Orban Co, Inc, 31 Exchange Pl, Jersey City 2, NJ

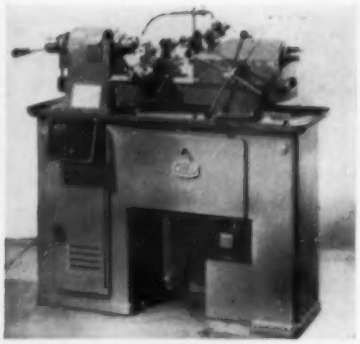
Booth 305

Miniature Expanding Mandrel

Micro-mite is designation for line of miniature expanding mandrels added to Le Count series. Precision internal-chuck-type mandrels are offered in six sizes for bores between ¼ and ⅜ in.

Line incorporates all of company's Count-Centric features, including guaranteed accuracy of 0.0002 in. TIR for Type SM and 0.0005 in. TIR for Type M. Hand operation eliminates need for an arbor press, thus making unit useful for non-ferrous materials of weak, thin section as well as for steel.

Le Count Tool Works, Inc, 390 Capitol Ave, Hartford, Conn **Booth 1107**



Weiler Hand Turret Lathe Has 1-in. Bar Capacity

Model RDU-260/38 hand turret lathe, imported from Western Germany, has a 1-in. capacity and uses Hardinge collet No. 5C. Featuring a two-speed reversible motor, machine has 16 spindle speeds and is driven by V-belt between the two anti-friction bearings in the headstock.

Single lever starts and stops spindle, opens and closes collet, and applies a spindle brake. By choosing another electric circuit on the control board it is possible to have the machine running continuously while opening and closing the collet. Choice of two spindle speeds in ratio of 1:4 in forward and reverse is available.

Features include forming and cut-off slide and a six-station indexing turret with ¾-in. toolholder bores. Coolant pump and fox-type threading attachment are available, as well as a bar feed.

Imported by Eric R Bachmann Co, Inc, 27-11 41st Ave, Long Island City 1, NY **Booth 1301**

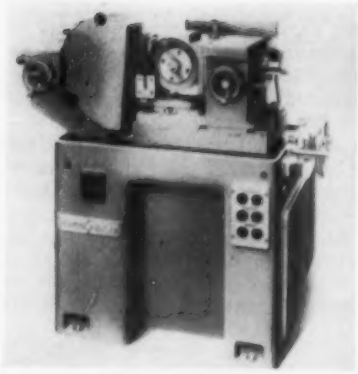
Cutting Coolant

Triple C is said to have extreme pressure lubricity, is water-soluble, non-oily, non-galling, anti-rust, smokeless and foamless, non-emulsified, non-flammable, and has high cooling properties.

Motch & Merryweather Co, 1250 E 222nd St, Cleveland 17, Ohio

Booth 1021

1-IN. MICROMETER reads by ten-thousandths as well as thousandths of an inch—*Brown & Sharpe Mfg Co, Providence 1, RI* **Booth 374**



Herminghausen Centerless Grinder Has 3/4-in. Bar Capacity

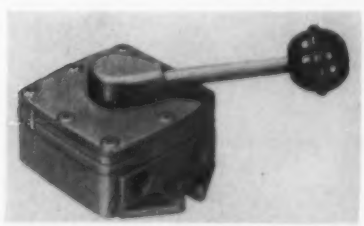
Model SR-1 centerless grinder, imported from Germany, is designed to fill gap in small and medium work as used for cylindrical and taper pins for instrument and precision parts.

Machine has a ¾-in. bar capacity and is equally suited for infeed, throughfeed, or barfeed. Diameter adjustments are made by feeding the feed-regulating wheel slide toward the grinding wheel. Slide is mounted on rollers to reduce friction, and feed nut is split and spring-loaded to eliminate backlash.

Adjustments can be taken in steps of 0.0001 in., readable on a micrometer screw. Feed-regulating wheel allows tilting, swiveling, and parallel adjustments to match faces of feed-regulating wheel and grinding wheel. Feed-regulating wheel is driven by a separate motor.

Standard equipment includes hand-fed, templet-controlled dressers for feed-regulating wheel and grinding wheel. Templets for both allow grinding of shaped parts.

Imported by Eric R Bachmann Co, Inc, 27-11 41st Ave, Long Island City 1, NY **Booth 1301**



Hannifin Air Control Valve

Four-way air control valve designated Lap Seal is packless, rotary-disk type, and is hand-operated. All four ports are in the same plane, with inlet and exhaust ports on one side and two cylinder ports on the other.

All ports are in the body, so that every internal part of the valve can be reached by removing cover and without disconnecting piping.

Disk-to-plate seal is airtight at all pressures. Either of two operating sequences can be provided, according to which of two designs of rotating disk is selected at assembly. Both are "closed center" designs, because supply air is blocked within the valve when the lever is in neutral. With one disk, both cylinder ports are open to exhaust in neutral; with other disk, both cylinder ports are blocked in neutral, making it possible to stop a double-acting cylinder in midstroke at the point where the trapped pressure equalizes the thrust on the two sides of its piston.

Valve is offered in sizes to accommodate ¼-, ⅜-, and ½-in. pipe lines. For 3-way use, one of the cylinder ports is plugged.

Hannifin Corp, Des Plaines, Ill **Booth 158**

New Brinell Hardness Tester Is Air-Operated, Semi-Automatic

Postive application of standard Brinell loads of 500, 1000, 1500, 2000, and 3000 kg is assured, according to the manufacturer, because gage mounted at top of machine indicates exactly what load will be applied before the test is made.

To operate the Air-O-Brinell, air pressure regulator valve is adjusted until desired load is indicated. Once load is set, any number of hardness tests can be made in rapid sequence. Load is applied by pulling out the plunger control valve, and released by pushing it in. Machines can be attached to a standard compressed air supply.

Tinius Olsen Testnig Machine Co, 6081 Easton Rd, Willow Grove, Penna **Booth 566**

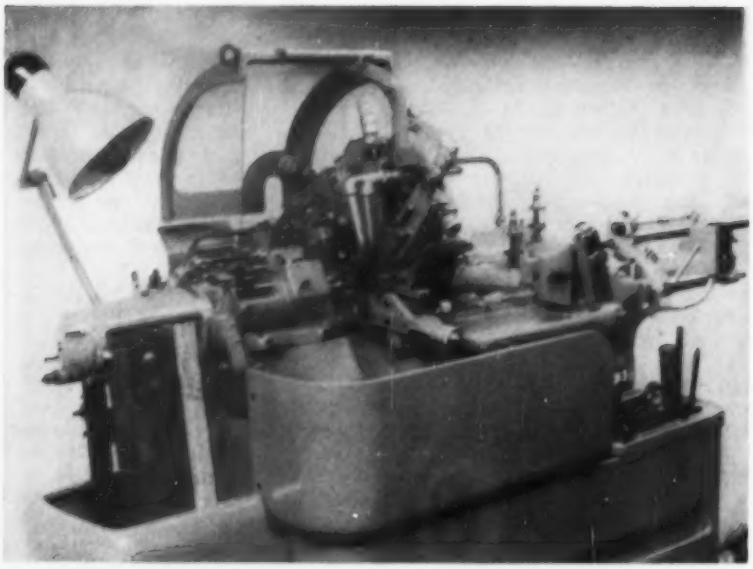
Profile Bending Machine

During a forming cycle, special pneumatic floating nose advances or contracts as the contour-shaped formed block revolves on the bending spindle. Bending can be accomplished in either direction.

Special equipment on the machine is a 4-way valve, muffler, air cylinder, filter-regulator, lubricator and shock tank. Unit can be converted into a bar or tube bender by changing tooling.

O'Neil-Irwin Manufacturing Co, 512 Eighth Ave, Lake City, Minn **Booth 1000**

ELECTRONIC TEMPLET AND CAM MACHINE, Model 104, generates external and internal contours on cams, templets, blanking punches and dies by following an enlarged conductive line drawing. Wide spindle-speed range from 48 to 11,500 rpm permits milling in tough materials with large cutters, fast carbide milling, and also grinding operations—*New England Tool and Machine Co, 913 Farmington, Berlin, Conn* **Booth 461**



Strohm Automatic Screw Machine Employs Five Turning Tools

Model M105 Swiss-type automatic screw machine, imported from West Germany, has a capacity of 0.394 in., employs 5 turning tools, and is capable of turning up to 4 in. in length. Adjustable accelerator is provided to speed production.

Most recent unit incorporates several improvements over previous models: rigid base, larger coolant tank, provisions for adding newly developed attachments, and stepped-up spindle speed to 10,000 rpm with relieved belt tension.

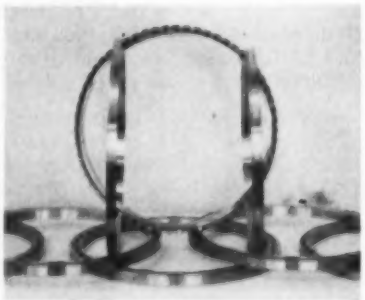
Hudson Automatic Machine & Tool Co, 3710 Hudson Ave, Union City, NJ **Booth 940**

Oscillating Torque Motor

Hydraulic-pneumatic device is designed to operate without cylinders, sprockets, chains, or complex linkages. Unit is capable of providing up to 280° rotation for turning, opening, closing, clamping, indexing, feeding, pushing or moving any type of load or mechanism.

Operates on air, oil, or fire-resistant fluids at efficiencies ranging from 95 to 98%; withstands heat up to 650 F. Higher torque ratings and greater operating efficiency are made possible through newly-developed low-loss vane seals. With use of proper controls, rotative speeds are limited only by fluid pressure volume. Fourteen mounting models are available, and four shaft styles.

Roto-Mation Inc, Greenville, Ohio **Booth 724**



TAPER ROLLER BEARINGS are addition to Reali-Slim line of Kaydon Corp. Single-row bearings are only ⅞ in. wide. Company also produces a line of radial roller bearings. Both types are available in a variety of sizes—*Kaydon Engineering Corp, McCracken St, Muskegon, Mich* **Booth 268**

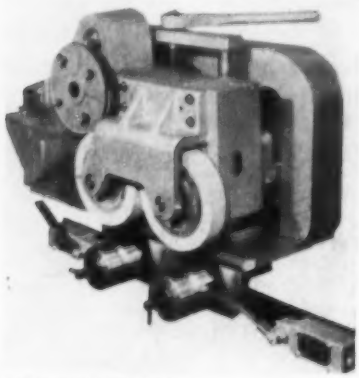
Toggle Clamps

Two additional models have been added to Case-Maul line of Red Head toggle clamps. Model PP-4 has ½-in. spindle, 1¼-in. travel, and a recommended delivered pressure of 400 lb. Maximum pressure is 600 lb.

Second model, PP-8, has ¾-in. spindle, 1½-in., travel, and a recommended delivered pressure of 800 lb. Maximum pressure is 1200 lb.

Construction features include cast-iron base, ribbed plastic handle, and heavy-duty rivets. Device locks in either position, pushed or pulled. Spindle comes tapped for 5/16 in. on PP-4, ⅜ in. on PP-8.

Case-Maul Mfg Co, 22 Harker St, Mansfield, Ohio **Booth 635**



Automatic Printer

Model 246 Offset Bar & Tube Printer is designed for production-line marking of bars, tubes, pipe, non-collapsible hose, and heavy wire. Unit processes stock from ½ to 6½-in.-dia, in any length, at speeds up to 300 fpm; can print large characters on small diameters.

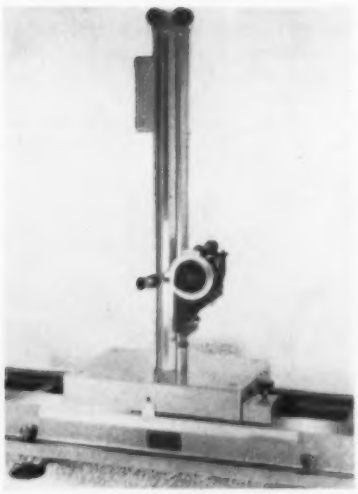
Jas H Matthews & Co, 3942 Forbes St, Pittsburgh 13, Penna **Booth 662**

Dial Indicators

Em-re line, with fully jeweled movements, is said to be 100% shockproof, and incorporates a gearing mechanism designed to stand up under severest conditions.

Units measure 2¼ in. in dia, weigh 4½ oz. Available in ranges from 0.025 to 0.250 in., with graduations of 0.00005, 0.0001, 0.00025, 0.0005, and 0.001 in.

Petz-Emery Inc, Pleasant Valley, NY **Booth 910**



Gaertner Optical Gage For Precision Measurement

No. M1238 coordinate cathetometer is an optical gage for coordinate and angular measurements in a vertical plane. Optical system is mounted on a precision vertical bar carrying a machine-divided scale; telescope is moved up and down to permit vertical measurements.

Vertical support and telescope are in turn mounted on a carriage riding on horizontal ways. Movement along these ways permits measurement in the horizontal direction by means of a precision divided scale and vernier.

Instrument has a total measurement range of 18 x 18 in. Readings can be obtained directly to the nearest 0.001 in.

Angular measurements can be made by means of a protractor ocular with rotatable crosshairs which reads to 3 min of arc.

Gaertner Scientific Corp, 1201 Wrightwood Ave, Chicago 14, Ill **Booth 1126**

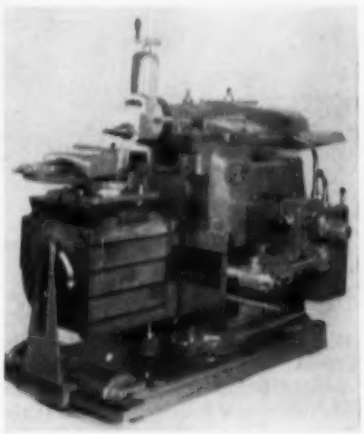
Power Package Combines Cylinder and Power Check

National Pneumatic Co power package offers a compact assembly of company's power-drive cylinder and power check. Unit is operable with air, water, or oil without changing any parts. Construction throughout is of lightweight alloy and steel.

Units are rated at 200 psi air and 500 psi water or oil. Bore diameters available are 1½, 2¼, 3, and 4 in.

Packages are offered with a systems mounting kit as well as foot, pivot, or flange mounting kits.

National Pneumatic Co Inc, 125 Amory St, Boston 19, Mass **Booth 244**



Swedish Shaping Machine Has 26-in. Stroke

VMA heavy-duty universal shaper, Model ES-26, has a stroke of 26 in. and features 10 power feeds and 8 ram speeds. All controls are grouped on one side of the machine for easy access.

Power rapid traverse to table is driven by an independent motor with automatic safety device. Hardened chrome-nickel gear transmission is on shafts and anti-friction bearings.

Unit has an automatic forced-lubrication system. Oil pump providing 400 psi secures constant oil flow to each lubrication point. Each pipeline is fed by an individual piston.

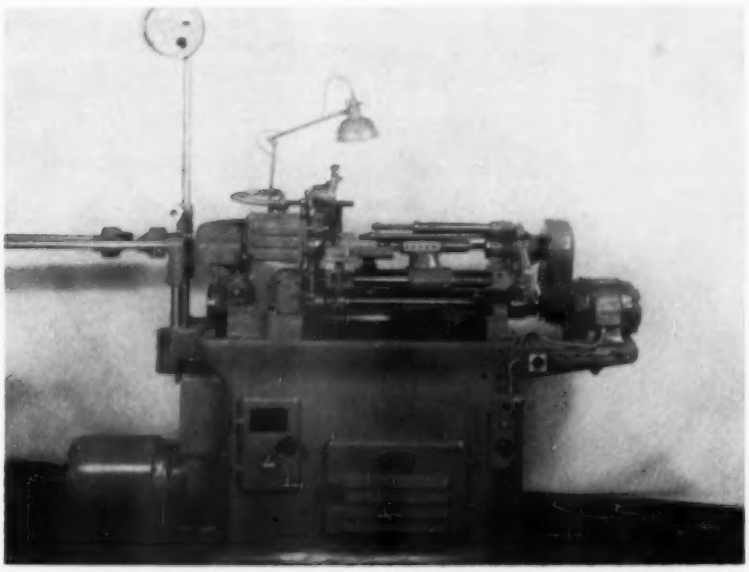
Other specifications: length of ram without tool slide, 51 in.; width of ram, 11 in.; length of ways in frame, 34½ in.; top clamping area of table, 17 x 25½ in.; feed length of tool slide, 8 in.

Imported by Austin Industrial Corp, 76 Mamaroneck Ave, White Plains, NY **Booth 550**

Dowel Pins

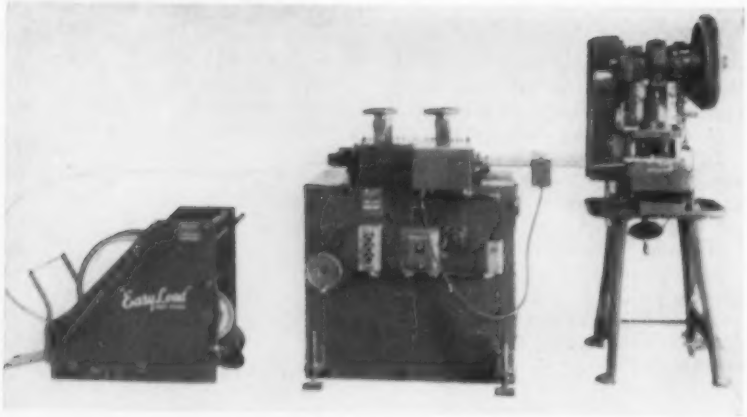
Bristol dowel pin sizes range from ⅛-in.-dia by ⅜-in. long to 1-in.-dia by 6-in. long. Surfaces are hardened and ground to a tolerance of 0.0001 in. Pins are offered in two standard sizes: 0.0002 in. over the listed diameter for regular use, and 0.001 in. over listed diameter for oversize service.

Bristol Co, Socket Screw Div, Waterbury 20, Conn **Booth 541**



SINGLE-SPINDLE AUTOMATIC SCREW MACHINE, imported from Germany by Guthery, is designated Traub Model A-42. Machine has a capacity of 1⅝ in., reportedly can be used effectively not only on long runs but on runs as long as 100 pieces efficiently. Machine is said to incorporate same advantages as smaller Traub models, such as high rigidity and ease of setup. Machine is shown equipped with threading and longitudinal turning attachments—*Imported by Guthery Machine Tool Corp, 58-31 Crescent St, Long Island City 1, NY*

Booth 420



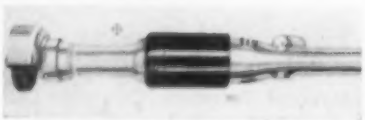
Straightening, Feeding Machine Fed by Automatic Coil Cradle

Rowe motorized coil cradle and straightening and bending machine (shown feeding a punch press) are available in a variety of sizes. Series R and S straighteners and feeders receive metal from coil stock automatically. Feed rates of R Series are from 18 to 95 fpm, S Series from 20 to 105 fpm. Maximum width capacity of R Series is 10, 15, and 20 in.; width capacity of S Series is 10, 15, 20, 24, 30, and 36 in.

Automatic standard coil cradles range in size from Junior Series, with load capacity of 200 lb, to 4000 Series which handles coils weighing up to 4000 lb. An even larger series has capacity of up to 15,000 lb and will handle widths up to 48 in. Coils are loaded into cradle either by hand or machine. Actuator which guides coil as it comes out of the cradle swings out of the way to facilitate loading operation.

Warner electric-clutch brake is used on straightening machines, so that motor runs continuously. Up to 60 starts and stops per minute are obtainable.

Rowe Machinery & Mfg Co, 1506 N Industrial, Dallas, Tex **Booth 921**



Buckeye Abrasive Tools

X-4 line of portable, air-powered abrasive tools includes completely redesigned horizontal grinders and buffers, vertical grinders and sanders, and right-angle sanders.

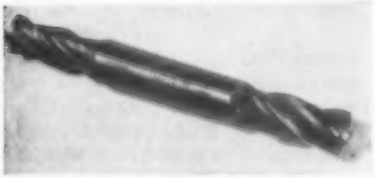
Main feature is a new, highly sensitive governor which enables tools to develop greater power and to maintain higher speeds under load, removing more metal in less time on any abrasive job. New models have no increase in weight or size.

Buckeye Tools Corp, PO Box 966, Dayton 1, Ohio **Booth 113**

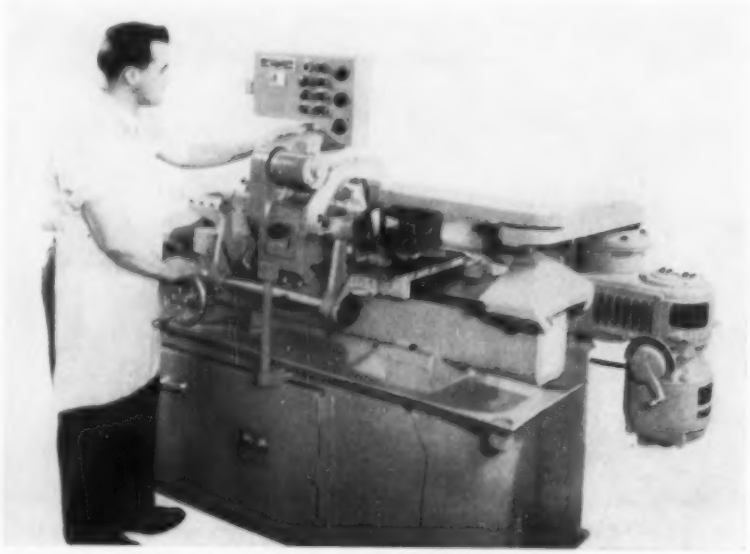
Milling Cutters

Eager Beaver line of shell end mill and face milling cutters is designed for faster stock removal and better finish through proper cutting angle and ample chip clearance. All ferrous and non-ferrous metals can be milled with the cutters by changing blades to proper grade of carbide.

Beaver Tool & Engineering Corp, Box 429, Royal Oak, Mich **Booth 444**



DOUBLE-END MILLS, of different diameter at each end of shank, are available in 2- and 4-lipped designs. Only half as many mills required for a range of sizes—*Brown & Sharpe Mfg Co, Providence 1, RI* **Booth 374**



ELECTRONIC AIRFOIL MILLING MACHINE, Model 102, produces irregular three-dimensionally contoured parts, such as jet-engine blades, vanes, and buckets, by copying a series of representative cross-sectional templets. Interpolating system enables machine not only to duplicate the cross-sectional templets, but also to generate the faired surfaces between and beyond these sections—*New England Tool and Machine Co, 913 Farmington, Berlin, Conn* **Booth 461**

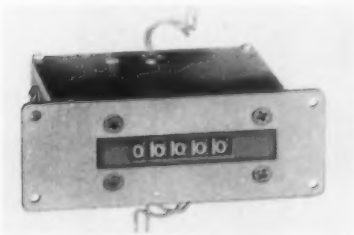
Aro Spot Welder Features Air-Hydraulic Drive

Model P-413 portable spot welder has the transformer built into the gun itself; primary and secondary windings, output leads, and electrodes are all water-cooled.

Drive by air-hydraulic power is reported to decrease operator fatigue and insure heavy forging pressure for so light a gun. Trigger built into the pistol grip controls the compressed air input. When trigger is pulled, compressed air actuates a piston which brings the oil under pressure; pressurized oil controls closing of the electrodes. Air also switches on welding current to initiate cycle. System is said to avoid electrode slap and bounce often found in air-operated welding equipment.

Optional equipment includes gyroscopic suspension which ensures balance of gun at all angles and gives full maneuverability in all directions.

Aro Spot Welders, Inc, 82 Beaver St, New York 5, NY **Booth 420**



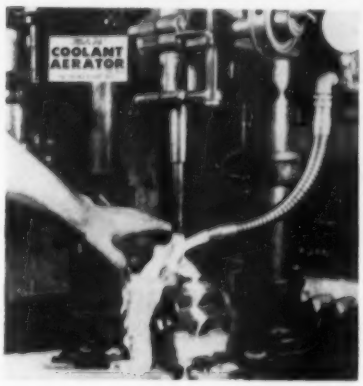
Electric Counter

Model 5-Y-8602-MF electric counter is addition to Durant line of electrically operated productimeters. Unit is designed for panel mounting and comes equipped with mounting plate.

"Add and subtract" unit adds one on impulse from one contact switch and subtracts on impulse from a second switch. Counter may be used to indicate number of pieces on a conveyor line at any time, or in production record systems for registration of stock reservation, withdrawals, or additions.

Over-all dimensions are 4⅜ in. long, 1⅝ in. wide, and 2⅝ in. deep. Operating speed is up to 500 counts per minute. Standard voltage is 110 v, 60 c ac.

Durant Mfg Co, 1945 N Buffum St, Milwaukee 1, Wisc **Booth 710**



Melard Coolant System Mixes Air With Coolant

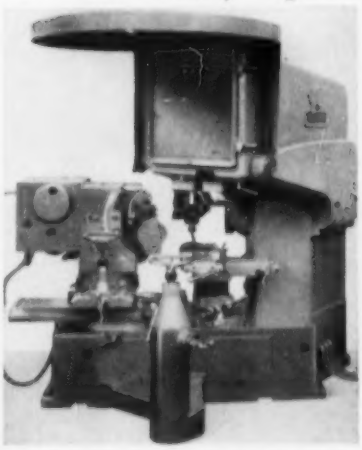
Mel-O-Flo coolant aerator is connected directly to the coolant line and mixes atmospheric air with the coolant, resulting in a non-splash aerated mixture. Mixture reportedly clings to work and tools, reducing throw-off and providing accelerated heat dissipation.

No special plumbing is required for attachment to coolant line. Aerated mixture leaves no vapors.

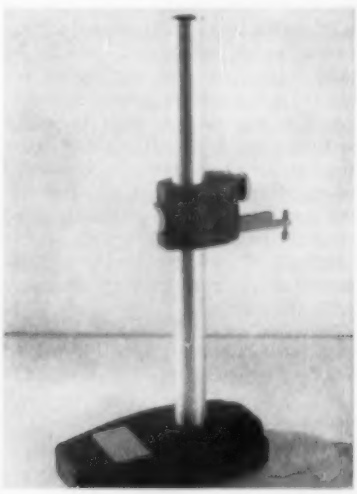
Unit features a built-in, self-cleaning mechanism. Whenever coolant supply is turned off, aerator is automatically purged of chips and sludge.

Melard Mfg Corp, 432 Austin Pl, New York 55, NY **Booth 1009**

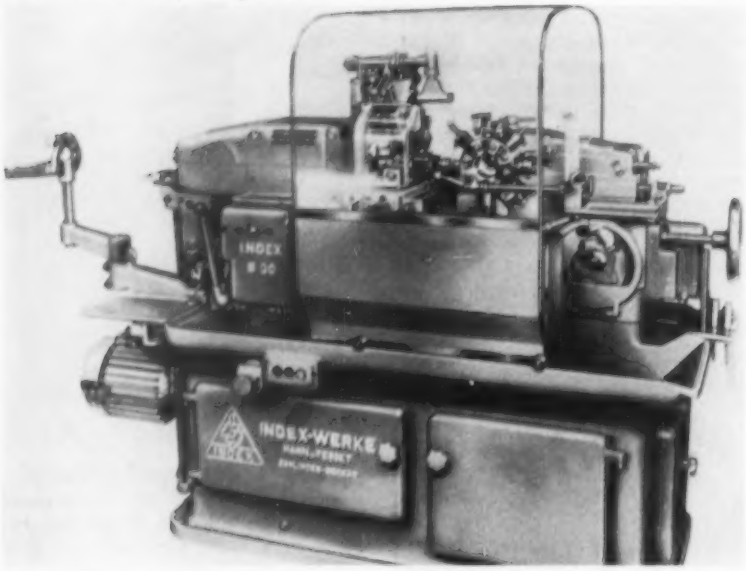
HEAVY-DUTY BORING SPINDLE made by Pope is reported capable of boring holes round within millionths of an inch. Spindle is available in both belt- and motor-driven types covering a wide range of speeds and horsepower —*Pope Machinery Corp, Haverhill, Mass* **Booth 392**



OPTICAL PROFILE GRINDER from Germany, Loewe Model SP, is designed for form tool grinding of flat and circular form tools, sectional dies and punches, and gages and templets. Machine features 20 x 20-in. screen with magnifications of 25X and 50X. Grinding wheel slide has stroke of 3 5/16 in. and allows adjustments for lateral relief angles of ±15° and axial relief angles up to 35°. Machine has two optical systems, one for shadowgraph projection and one for reflection projection. Crush dressing attachment is available optionally, as well as dust collection unit and circular form tool grinding attachment—*Imported by Eric R Bachmann Co, Inc, 27-11 41st Ave, Long Island City 1, NY* **Booth 1301**



HEIGHT GAGE, Hite-Chek, for use on surface plates and for machine settings, has rugged holding post with fine adjustment for accurate transferral of precision settings. Has both ball and post for holding dial attachments —*Brown & Sharpe Mfg Co, Providence 1, RI* **Booth 374**



German Automatic Screw Machine Has Turret Design

German-made Index Type B automatic screw machine handles work up to 2⅝-in. bar capacity. Unit is equipped with four standard cross-slides of rigid design, and can be supplied with 6- or 8-hole turrets.

Easy setting is achieved by cams' being mounted in a common block which can be changed from one job to another as a unit in a few minutes. Cam levers can be lifted off cams in one easy movement.

Large variety of attachments eliminates second-operation work on components, such as milling or eccentric drilling from turret. Spindle-locating attachment with indexing feature is used for milling and drilling flats or cross-holes in a definite relationship to each other. Thread-chasing attachment is available for external and internal threads, and a longitudinal and profile turning attachment permits turning of many intricate forms.

Imported by Wickman Products Corp, 10325 Capital Ave, Detroit 37, Mich **Booth 597**

Pin-Mount Core Drill

Metcut tool consists of a drill body and either a high-speed or carbide-tipped replaceable cutter. Cutter is secured to drill body by Allen head cap screw, and is accurately positioned and driven by four pins located in center of each flute. Use of driving pins reportedly makes it possible to provide much deeper and more perfectly formed flutes, and up to 60% greater chip space for easier disposal.

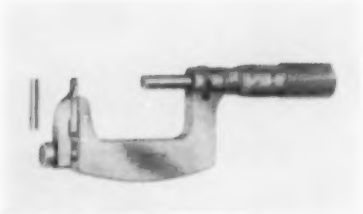
Tools are available in standard and special sizes from ¾-in.-dia up to 5 in.

Metal Cutting Tools, Inc, 301 S Water St, Rockford, Ill **Booth 1143**

Expanded Line of Kendex Tooling

Line includes 17 styles available in over 100 tools for use in lathes, planers, automatic cycling machines, and as blades for milling cutters. Products available are holders with positive and negative rake, heavy-duty types, and a complete line of button-type inserts. Inserts are furnished with all surfaces ground, or with only top and bottom ground. Wide selection in standard nose radii is offered in six different grades.

Kennametal Inc, Latrobe, Penna **Booth 475**



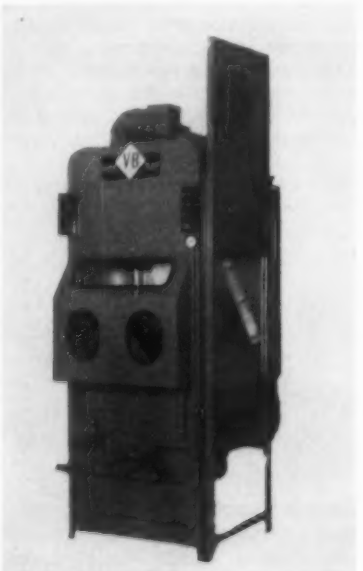
Interchangeable-Anvil Mikes

Two sizes of Multi-Anvil micrometers (0 to 1 in., and 1 to 2 in. in thousandths) are furnished with two anvils: (1) an 0.120-in dia (approximately) rod anvil, and (2) a flat anvil 0.125 in. and 0.060 in. thick at opposite ends. Rod anvil measures from a hole to an edge; flat anvil measures distance from insides of slots and grooves to an edge. Additional anvils can easily be made up in the shop.

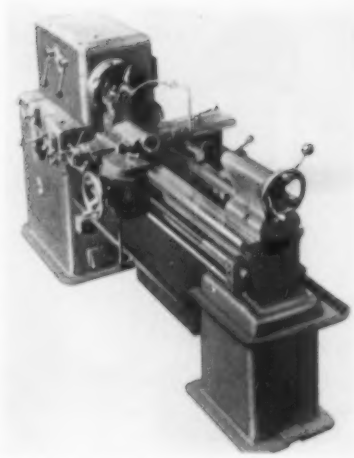
Vise-frame holds the anvils, which can be changed over by placing one in the vise and tightening the locking screw. Micrometer can also be used as a height gage by removing clamping vise jaw.

Other features: balanced design, no-glare satin chrome finish, hardened and ground spindle, Hi-Micro lapped anvil and spindle faces, quick reading graduations, convenient decimal equivalents on frame.

L S Starrett Co, Athol, Mass **Booth 1116**



VAPOR BLAST LIQUID HONING MACHINE, Model 3030, employs a special Vapor Blast Gun for cleaning and deburring of tubes internally—*Vapor Blast Manufacturing Co, Milwaukee, Wis* **Booth 218**



Harrison Gap Lathe Has 16-in. Swing

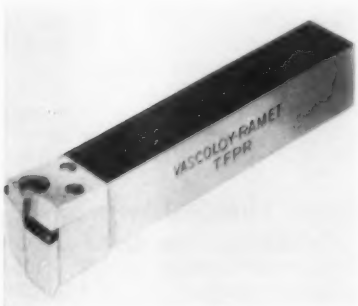
Geared-head, quick-change lathe with removable block in gap is imported from England. Machine has 16-in. swing over ways and 24-in. through gap. Bed length admits 36 in. between centers.

Twelve speeds range from 38 to 600 rpm. Spindle is equipped with Timken taper roller bearings; L2 spindle nose has hole bored to pass 3-in. bar.

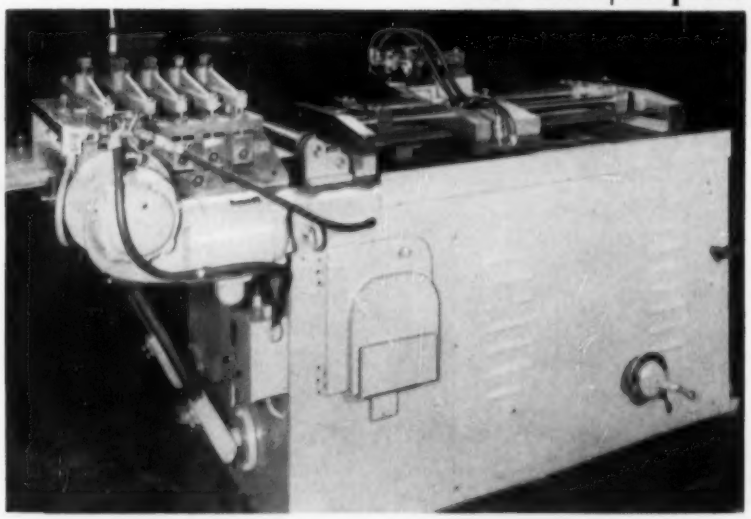
Machine is arranged for V-belt drive and includes 5-hp motor and pushbutton control with thermal overload protection. Standard equipment includes electric clutch and brake with 14-in-dia face plate, drive plate, follower rest, and two centers. A wide variety of accessories is available.

Imported by Stanley Sheppard, 30 Church St, New York 7, NY

Booth 415



FACING TOOL, Style TFPR, is designed for use where positive-rake machining is necessary for optimum results. Tool illustrated is for facing with a 6° positive rake, and uses triangular throwaway inserts giving 6 cutting edges. Tool is also available in left-hand Style TFPL — *Vascoloy-Ramet Corp, Waukegan, Ill* **Booth 1137**

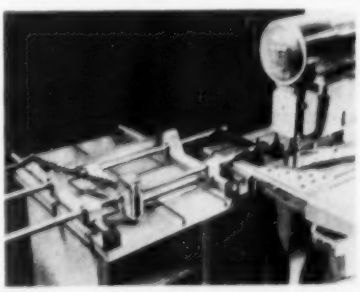


Cabinet-Mounted Slide Feed

Model SFC-24-24 is driven by a 5-hp motor with variable speed control. Since it is independently driven, it can be used for feeding in any direction.

Features include 8-roll plain straightener with pair of motor-driven take-in rolls; width capacity up to 24 in.; maximum feed length adjustable up to 24 in. at one stroke; electric clutch and brake; selector switch for single stroke or continuous operation.

US Tool Co, Ampere, NJ **Booth 375**



Wales Duplicator Device Controls Punch Pattern

Positive Duplicator is designation for pantograph-like mechanical device which locates holes in simple or complicated patterns and actuates punching mechanism by remote control from a templet. Device consists of a one-piece steel worktable with T-slots running across both dimensions for clamping templets in position. On each side of table is mounted a hardened and ground bar on which a carriage assembly rides for forward and backward positioning.

Carriage contains bearing supports for two hardened and ground traverse rods for lateral positioning. Locator assembly with hand grip and pushbutton is mounted on these crossrods. Adjustable clamps for securing work are located at end of rods.

Locator carriage assembly moves in any direction, and work, held by clamps, is automatically moved simultaneously into position under the punching mechanism. As each hole is located, operator depresses locator pin into templet aperture. This automatically closes microswitch in locator assembly and actuates air cylinder which in turn operates trip mechanism, effecting the punch.

Device is designed to be used with Wales Fabricator punch.

Wales-Strippit Corp, North Tonawanda, NY **Booth 379**

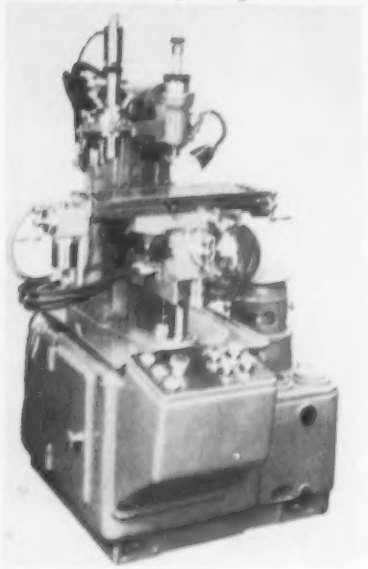
Oakite Rustripper

Alkaline compound removes rust, oxide scale, paint, and shop soils without changing dimensions of precision parts, or causing hydrogen embrittlement, according to the manufacturer.

May be used in hot or cold water solutions, with or without current, and with or without cyanide. It does not attack sound metal; all action stops as soon as rust has been removed. It is said to provide temporary protection against re-rusting.

Oakite Products, Inc, 19 Rector St, New York 6 NY **Booth 1325**

Tool Show | in print



British Profile Miller For Automatic Copying

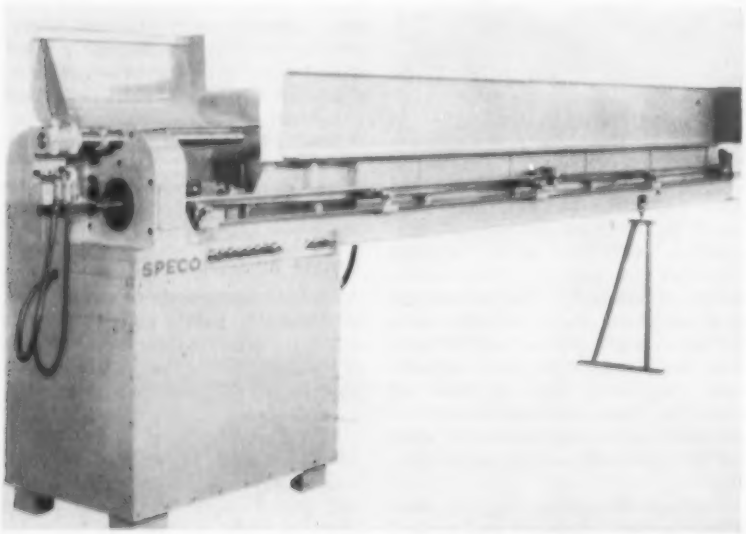
Wickman-Hayes Tracemaster is fully automatic profile milling machine used for three-dimensional copy milling of dies, forging dies, plastic dies, rubber and glass molds, turbine blades, and all work of irregular shape.

Both cross feeds and vertical feeds are automatically controlled, so that constant rate of feed relative to form being copied is maintained. Machine reportedly will accurately copy cavities with vertical faces without danger of cutter digging in.

Standard specifications: table, 32 x 8¾ in.; longitudinal table traverse, 16 in.; cross-traverse of table, 8 in.; quill, 2½ in.; spindle speeds, 50 to 2400 rpm in nine steps.

Imported by Wickman Products Corp, 10325 Capital Ave, Detroit 37, Mich **Booth 597**

POPPET-TYPE VALVES in Hannifin P-M series are offered as 2- or 3-way valves to operate either normally closed or normally open to pressure, and as 4-way valves. Either body type is available with a single solenoid or with two solenoids for momentary-contact service, or without an integral solenoid pilot head for remote pressure control. Illustrated is Model BJ4-75, which takes a ¾-in. line and has double-solenoid construction—*Hannifin Corp, Des Plaines, Ill* **Booth 158**



BREHM TUBE CUTTER automatically cuts any length of tubing from ⅛ in. up. By changing cutting adapters, unit processes tubing in diameters from ⅜ to 2¼ in. Hydraulically operated machine is 17 ft long, 30½ in. wide, 60 in. high—*Steel Products Engineering Co, Springfield, Ohio* **Booth 660**

Automatic Nut Countersinker

Model N is designed to countersink accurately both sides of nut blanks which have been cut from bar stock on automatic screw machines.

Unit will accommodate nut sizes 2-56 up to and including ½-13 through the use of individual tracks available from stock for standard hex sizes. Production rate is approximately 3000 blanks per hr on the ½-13 size, and over 5000 per hr on the 2-56 size.

Model Machine Co, 4729 Hawthorne St, Philadelphia 24, Penna **Booth 739**

Heavy-Duty Air Hammer

Unit, which can be operated with one hand, delivers up to 2200 blows per minute at less than 80 psi. Safety chuck locks tool in six positions.

Model weighs 4 lb; over-all length is 9 in.; tool-shank diameter is ⅝ in.; piston stroke is 3¼ in.

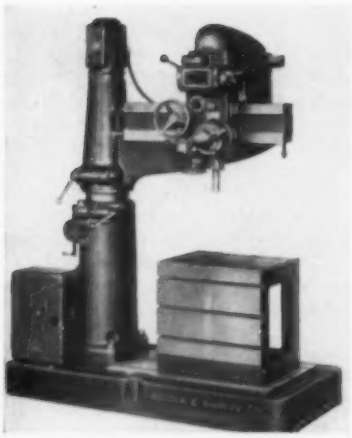
Superior Pneumatic & Manufacturing, Inc, 4758 Warner Rd, Cleveland 25, Ohio **Booth 1224**

Circular Form Tool Sharpener

Dres-O-Grind fixture can be used to sharpen all three sizes of B&S circular form tools.

Incorporates built-in mounted diamond, aligned to proper height in relation to the tool, and toolholder setting for predetermined top rake. Operator can take rough grinds, redress steel for good finish cut, and finish-grind without resetting the grinding machine.

Walter H Brooke, 5740 W Chicago Ave, Chicago 51, Ill **Booth 432**



British Radial Drilling And Tapping Machine

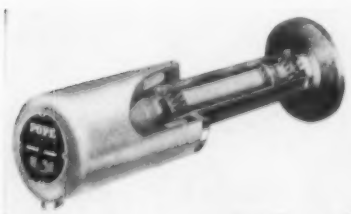
Adcock & Shipley radial drilling and tapping machine, Type SV, is high-speed British unit, available with either power- or hand-elevated column. Radial arm rotates on large-diameter ball bearing. Saddle carries spindle-operating mechanism, and is traversed along arm by hand-wheel upon roller bearings.

Drill capacity in mild steel is 1 in.; tap capacity is ⅝ in. Spindle covers maximum radius of 36 in., minimum radius of 12 in. Spindle speeds range from 96 to 1750 rpm; three feed rates are 90, 120, and 180 ipr.

Variable-speed motor mounted on saddle gives four electrical speed changes, obtained by controller at front of saddle. Double gearing, engaged by lever on saddle, doubles range of speeds and provides low, powerful range of speeds for heavy-duty operations and tapping.

Imported by Stanley Sheppard, 30 Church St, New York 7, NY

Booth 415



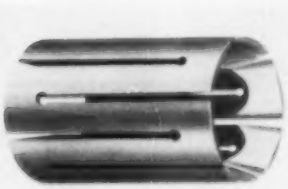
SURFACE GRINDER SPINDLE added to Pope line is 1-hp, 3600 rpm model which operates on ac or dc at 60 cycles. Motorized model is enclosed and non-ventilated. Total length is 18 in., diameter is 6 in. Bearing setup included double-row cylindrical roller bearings and separate thrust bearings which eliminate endwise movement—*Pope Machinery Corp, Haverhill, Mass*

Booth 392

Button-Head Socket Screws

Bristol button-head socket screws are available in range of sizes from No. 4 wire size to ⅝-in. diameter, with a variety of lengths in each size. Screws are made of heat-treated alloy steel, with hex sockets. Screws are designed for applications which require smooth-headed fastener and tight clearances.

Bristol Co, Socket Screw Div, Waterbury 20, Conn **Booth 541**

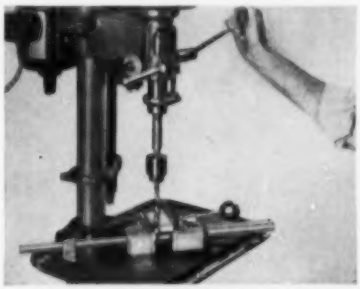


Woodworth Collet Arbor In Variety of Sizes

Tork-lok design in collet arbor employs use of inclined flats in both collet sleeve and arbor shaft. Positive drive is guaranteed through these mated flats. Built-in safety stops control both expansion and contraction. Contraction is restricted to maintain a pre-load which assures a metal-to-metal seal that excludes dirt and chips.

Device is a stock item in three styles: between - centers, flange-mounted draw-bar, and air-operated draw-bar. Seventy-eight collets are available in a range from 0.500 to 2.562 in.

N A Woodworth Co, 1300 E Nine Mile Rd, Detroit 20, Mich **Booth 412**

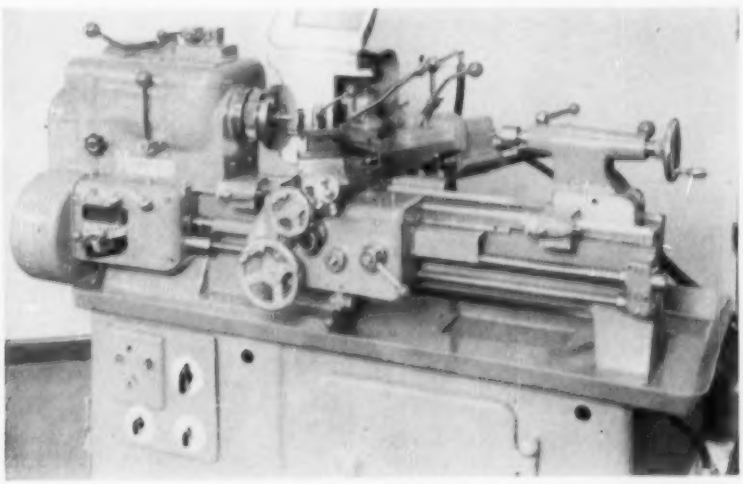


DRILLPRESS VISE, Heinrich No. 13WH, has a capacity of 6 in. Vise comes with table-mounting attachment, can be swung away from the table when not in use. Device is equipped with company's "Circle-Grip" locking mechanism—*Heinrich Tools, Inc, 1536 Clark St, Racine, Wisc* **Booth 788**

1-ton Multipress

Unit, designed for varied operations, fits into automated lines. Ram pressure can be quickly set from 500 to 2000 lb. Dual electric control system insures safety, as press will operate only when both hands are on actuating buttons.

Denison Engineering Co, 1160 Dublin Rd, Columbus 16, Ohio **Booth 1706**



HARRISON GEARED-HEAD LATHE, imported from England, has 11in. swing and built-in hydraulic copying attachment. Distance between centers is 22 in. Machine has two-speed 3½-hp reversing motor, allowing 16 spindle speeds from 45 to 2000 rpm. Other features include pushbutton control with thermal overload protection; quick-change gear box; 6-in. drive plate; 10-in. face plate; and steel cabinet base—*Imported by Stanley Sheppard, 30 Church St, New York 7, NY* **Booth 415**

Tool Show | in print

Wilson Hardness Tester Is Fully Automatic

Rockwell hardness testing is possible on a production basis with machine said to be fully automatic. Equipped with vibratory feed, device is capable of testing hardness of ferrous and non-ferrous metals at the rate of approximately 1000 parts per hour.

Parts, after testing, are routed into bins labeled "Hard," "Soft," and "Good." Colored lights mounted above the dial show the classification of each part as it is being tested.

Photo-transistor circuit can be set to control hardness limits as close as two Rockwell points. Tester regulates vertical travel of the elevating screw, so that the device can automatically test pieces of varying diameters and thicknesses.

American Chain & Cable Co, Inc, Wilson Mechanical Instrument Div, 929 Connecticut Ave, Bridgeport 2, Conn
Booth 909

STATIC BALANCING MACHINE, Taylor Model SB, is air actuated. Operator presses button and amount and location of out-of-balance is read on company's Hi-Max spirit level. Machine is available in six sizes to handle work up to 60 in. in diameter—*Taylor Dynamometer & Machine Co, 6411 River Parkway, Milwaukee 13, Wis*
Booth 779

Automatic Center Punch

No hammer is needed with center punch that has an automatic striking mechanism with adjustable striking force—you just press the lightweight aluminum handle and a built-in mechanism strikes a perfect center mark. Force of blow is regulated by knurled cap. Once set, the punch will strike a mark of the same depth every time.

All working parts are of hardened tool steel. Point is removable for sharpening or replacement. Handle has diamond-knurled bands for strong, comfortable grip.

Similar punch, with beveled-edge, self-centering locating sleeve is available for centering holes through hinges and other hardware and for centering countersunk holes.

L S Starrett Co, Athol, Mass
Booth 1116

Tool Steel

Vanadium-Alloys Steel Co line of tool steels has been enlarged to incorporate following:

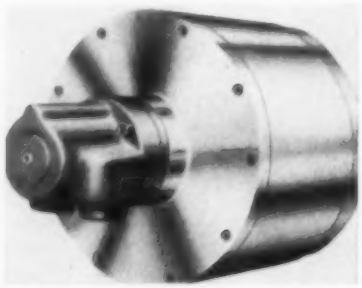
Hotform V steel is 1% vanadium modification of Hotform No. 2, a steel used for aluminum dies and cores. Slightly higher carbon content balances extra ½% vanadium.

Chromewear is steel designed with highest possible wear resistance for use in refractory and ceramics industries where abrasion resistance is of prime importance. Steel is reported tough enough for most tool applications.

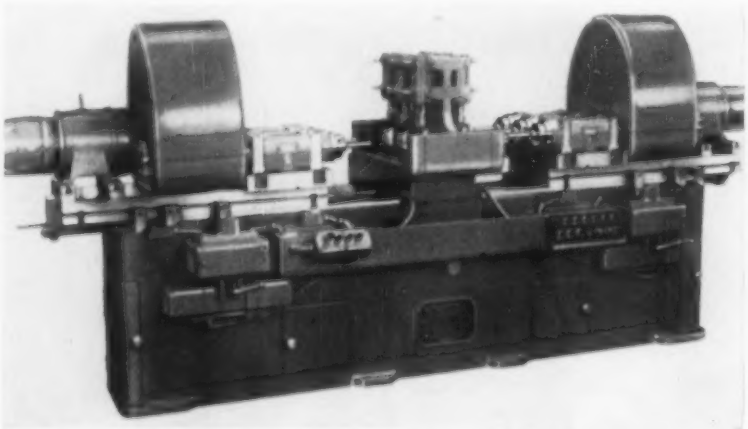
MC is medium carbon-alloy die steel produced for molds and cavities where high surface finishes are desired. Hardnesses of 300 to 350 Brinnell are reportedly obtainable throughout sections as large as 20 x 10 in. after oil quenching and tempering.

WCC is steel for hot-work application which contains tungsten, chromium, cobalt, and vanadium. Physical properties at elevated temperatures are reported to be higher than those of standard 9.50 tungsten grades of hot work. Alloy is said to be a very deep hardening steel.

Vanadium-Alloys Steel Co, Colonial Steel Div, Latrobe, Penna **Booth 1511**



ROTATING HYDRAULIC CYLINDER, furnished in various bore sizes, is rated for use with pressures up to 500 psi, speeds up to 3000 rpm. Line of square-end air cylinders is available in 11 bore sizes from 1½ through 14 in., with 21 types of mountings—*S P Manufacturing Corp, 12415 Euclid Ave, Cleveland 6, Ohio* **Booth 257**

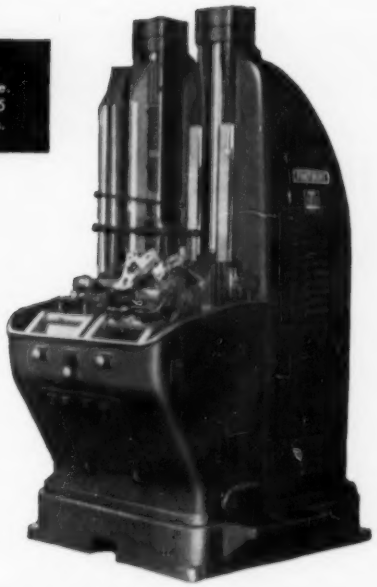


SIMPLEX 2U 2-WAY HYDRAULIC-FEED PRECISION BORING MACHINE with six No. 2 boring heads and hydraulically clamped workholding fixture is designed to hold 6 pistons for semi-finish and finish-boring of wrist pin holes. Operator loads one side while the other is boring. Rated production is 375 pistons per hr at 100% efficiency—*Simplex Machine Tool Corp, 4548 W Mitchell St, Milwaukee 46, Wis*
Booth 1612

Show-in-Print Section continued on page 272

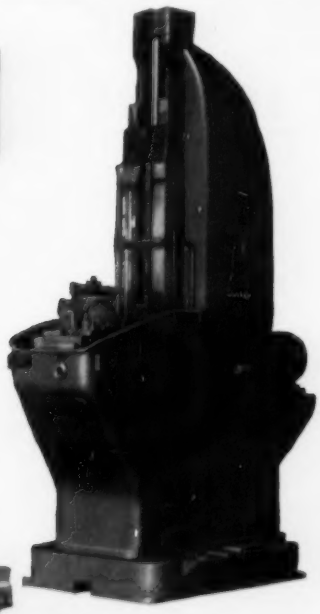
A FASTER *more economical* MACHINE OPERATION

Duplex Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.

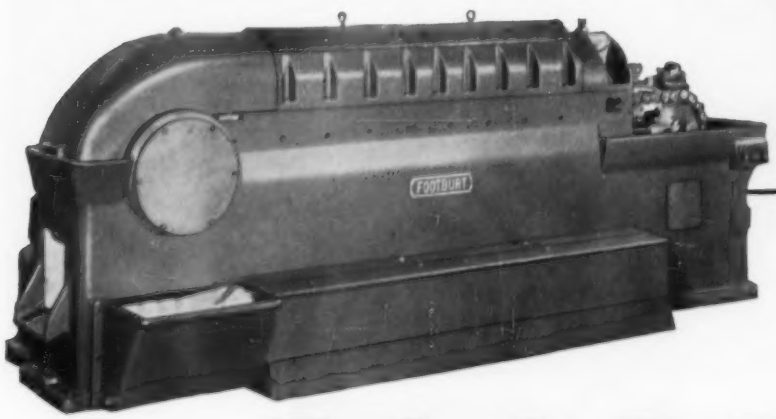


■ Footburt Surface Broaching may be the answer to your problem of faster machining. Many jobs that were slow and expensive when handled by conventional machining methods are now being produced by Surface Broaching. Production in most cases is as fast as the speed at which parts can be loaded. Yet cutting speeds are so low that the cost of tool maintenance shows great savings. Exceptional finish can be maintained. We will gladly discuss your machining problems with you.

Single Slide Surface Broaching Machine. Made in 5, 10, 15 and 25 Ton Sizes.



THE FOOTE-BURT COMPANY
Cleveland 8, Ohio
Detroit Office: General Motors Building



Continuous Type Broaching Machine. Made in 5 Sizes.

FOOTBURT

PIONEERS IN SURFACE BROACHING

INCREASE GEAR SHAVING OUTPUT *with* VERSATILE SEMI-AUTOMATIC LOADING

The operator handling a conventional rotary gear shaving machine is required to make 7 separate motions for each work part shaved.

With semi-automatic loading this is reduced to just 3 operations.

1. Place work gear on the pre-locater.
2. Press the start button.
3. Remove the shaved gear.

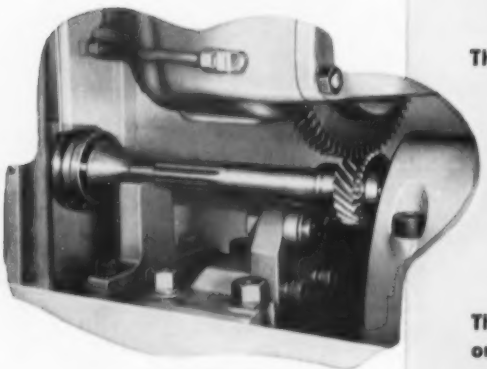
The rest of the cycle is automatic.

Results are:

- Higher production
- Lower machining costs
- Less operator fatigue
- All the versatility of conventional shaving
- Greater safety
- Operator has ample time to serve 2 or more machines

The approximate work locater and head and tailstock centers or plugs are the only work part changes that are additional to a conventional gear shaver.

Red Ring Shaving Machines, Models GCU and GCI may be equipped with this equipment.



Write for Estimated Savings on Your Particular Operation.

Plastic Splash-Guard Used for Demonstration Only.

ORIGINATORS OF ROTARY SHAVING

NATIONAL BROACH & MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

7308 *WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT*

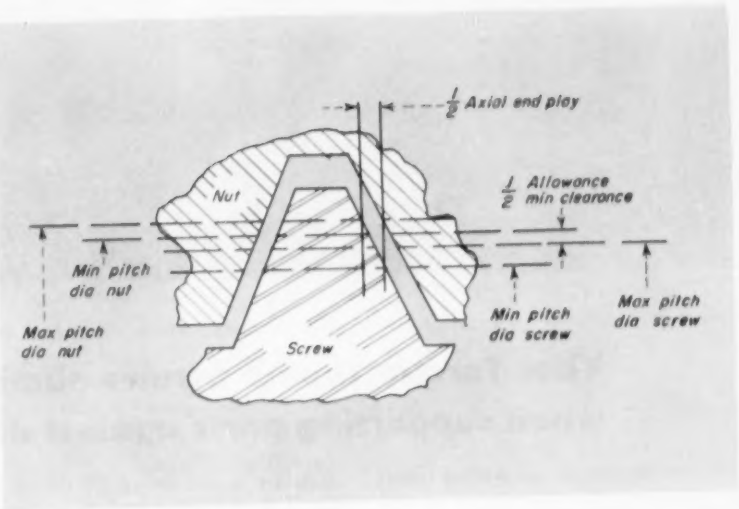
END PLAY OF ACME SCREW THREADS . . . I

D. SWEET, tool engineer

All general-purpose Acme threads are designed to allow a certain lateral movement when assembled. This end play is related to the class of fit.

Maximum end play is usually more important than minimum end play. To find the maximum end play, subtract the minimum pitch diameter of the screw from the maximum diameter of the nut, and multiply the result by tan 14° 30′. See diagram.

The nomograms that will appear in an early number make it possible to determine the correct fit to afford the desired end play. It is necessary only to lay a straightedge from the screw size to the number of threads per inch and read the maximum end play on the center scale.

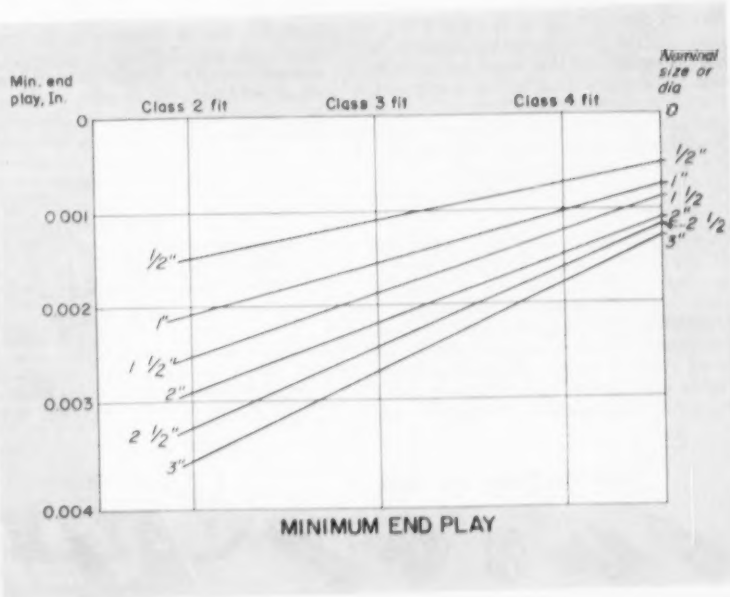


EXAMPLE:

An old-style ⅝-8 Acme screw was designed for an end play of 0.005 in. max, when assembled. What class of fit should the designer specify for a ⅝-8 Acme thread (ASA B1.5—1952) to obtain the same end play?

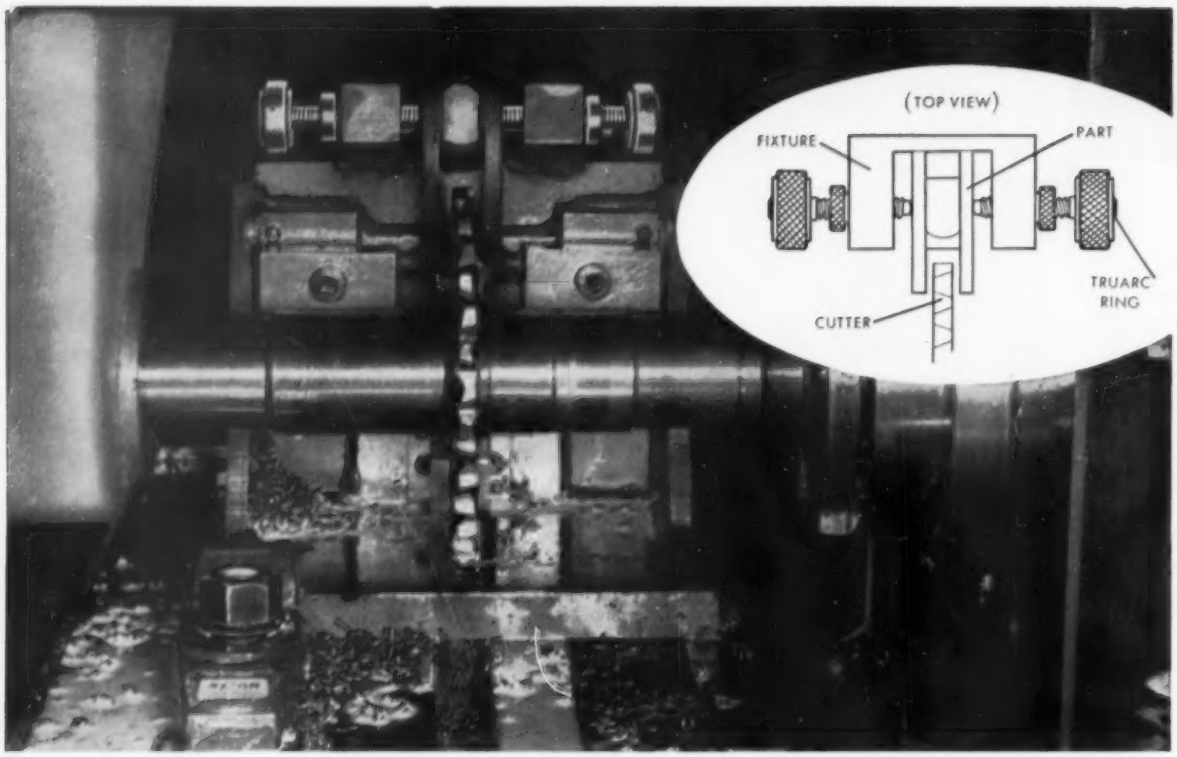
Max end play = Nut PD max − Screw *PD* min times tan 14° 30′
= 0.5697 − 0.5506
= 0.00494 in.

By application of a straight edge to the nomogram (future issue) for a Class 3G fit, it will be seen that the end play scale is cut at 0.0049 in.



MINIMUM END PLAY

One chart, reproduced herewith, can be used to find the minimum end play for all classes of fit. The value of the minimum end play depends only on the nominal size or diameter of the screw.



...at North American Aviation, Inc., Los Angeles Division:

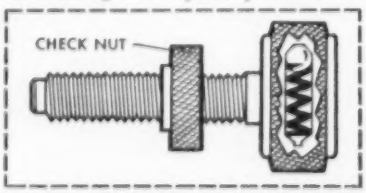
Vlier Torque Thumb Screws eliminate guesswork when supporting parts against drill or mill thrust

Prevent inaccurate machining which always occurs when work is not properly supported...

Vlier Torque Thumb Screws are simple, precision tools. They provide an accurate means of holding or supporting a part with a predetermined amount of end pressure. When used beneath or behind cutters as a positive support, they eliminate chatter, vibration and prevent deflection of the part which would result in loss of size. *Even fragile, thin-walled parts can be held securely against machining pressures without distortion.*

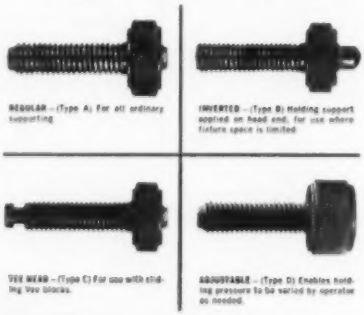
Impossible to overtighten...The head of the Vlier Torque Thumb Screw is designed with an *accurate*, spring-controlled ball-check which functions *automatically*. When the predetermined supporting pressure is reached, the head rotates freely, *preventing overtightening of the screw*. Spring pressures are determined at the factory and accuracy is guaranteed for the life of the tool. A knurled lock-nut prevents loosening of the screw due to chatter or vibration. Backing off action is positive at all times.

Built to last a lifetime...Design of Vlier Torque Thumb Screws is extremely simple. There is nothing to wear out; nothing to jam; nothing to get out of adjustment. By removing a Truarc ring the head can be taken apart for cleaning. Cover plates protect moving parts from dust, chips, etc., assuring years of profitable use. Order a supply of these money-savers from your Vlier distributor today.



In the Vlier Torque Thumb Screw spring pressure is applied perpendicular to screw axis, eliminating inaccuracies due to wobble or "slop" as wear occurs.

Available in four types; 19 models


REGULAR – (Type A) For all ordinary supporting.
INVERTED – (Type B) Holding support applied on head end, for use where fixture space is limited.
VEE HEAD – (Type C) For use with cylindrical Vee blocks.
ADJUSTABLE – (Type D) Enables holding pressure to be varied by operator as needed.

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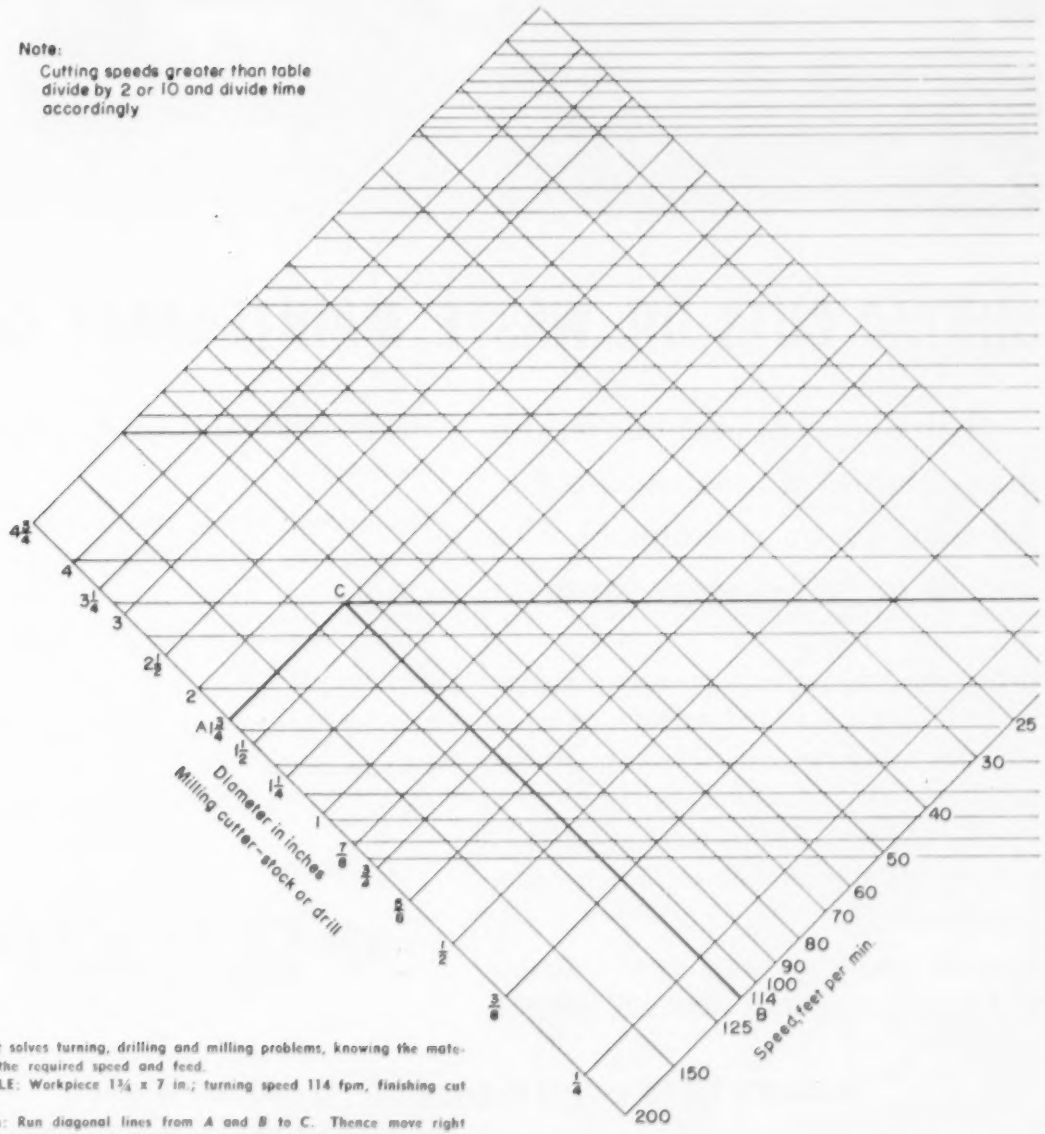
PRODUCTION MACHINING CHART . . . I

ROBERT BROWN, WOLVERHAMPTON, ENGLAND



This chart solves turning, drilling and milling problems, knowing the material and the required speed and feed.

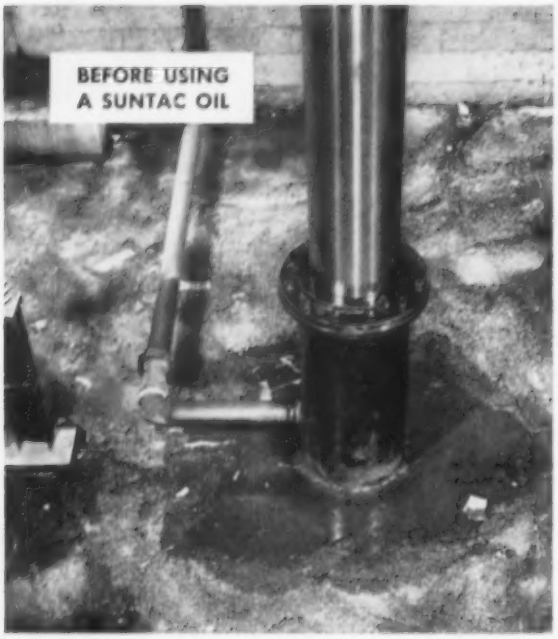
EXAMPLE: Workpiece 1¾ x 7 in.; turning speed 114 fpm, finishing cut 0.003 in.

Solution: Run diagonal lines from *A* and *B* to *C*. Thence move right to *D*, which is intersected with line from *E* from the stated feed of 0.003 ipr. Line *CD* cuts speed scale at 250 rpm.

Drop line from 7 in. dia, at *F*, to intersect at *G* with diagonal from *D*, thence move right to time scale at *H*, giving time as 9 min.

When a milling operation is involved, the cutter dia is substituted for stock dia, and cutter runout is added to the length of cut.

Because of its size, the Chart is reproduced in two parts, which appear on this page and page 239. These can be matched along the CD line.



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High quality Suntac oils reduce drip...throw-off...squeeze-out... cut leakage an average of 35% and up to 90% in some cases.

Before using Suntac oil, a prominent eastern manufacturer had to add excessive make-up oil to the hydraulic system of his freight elevator. Oil leakage caused a continual housekeeping problem...the pit had to be cleaned out every six to eight weeks and maintenance costs were high.

Now, one year after switching to a Suntac oil, make-up has been drastically reduced, and frequent pit clean-ups are no longer necessary.

The reason: Suntac oils are specially compounded oils with adhesive-cohesive characteristics that enable them to cling to parts where other oils would drip, throw-off, leak, and squeeze out.

For complete information about Suntac oils, see your Sun representative, or write SUN OIL COMPANY, Philadelphia 3, Pa., Dept. AM-3.

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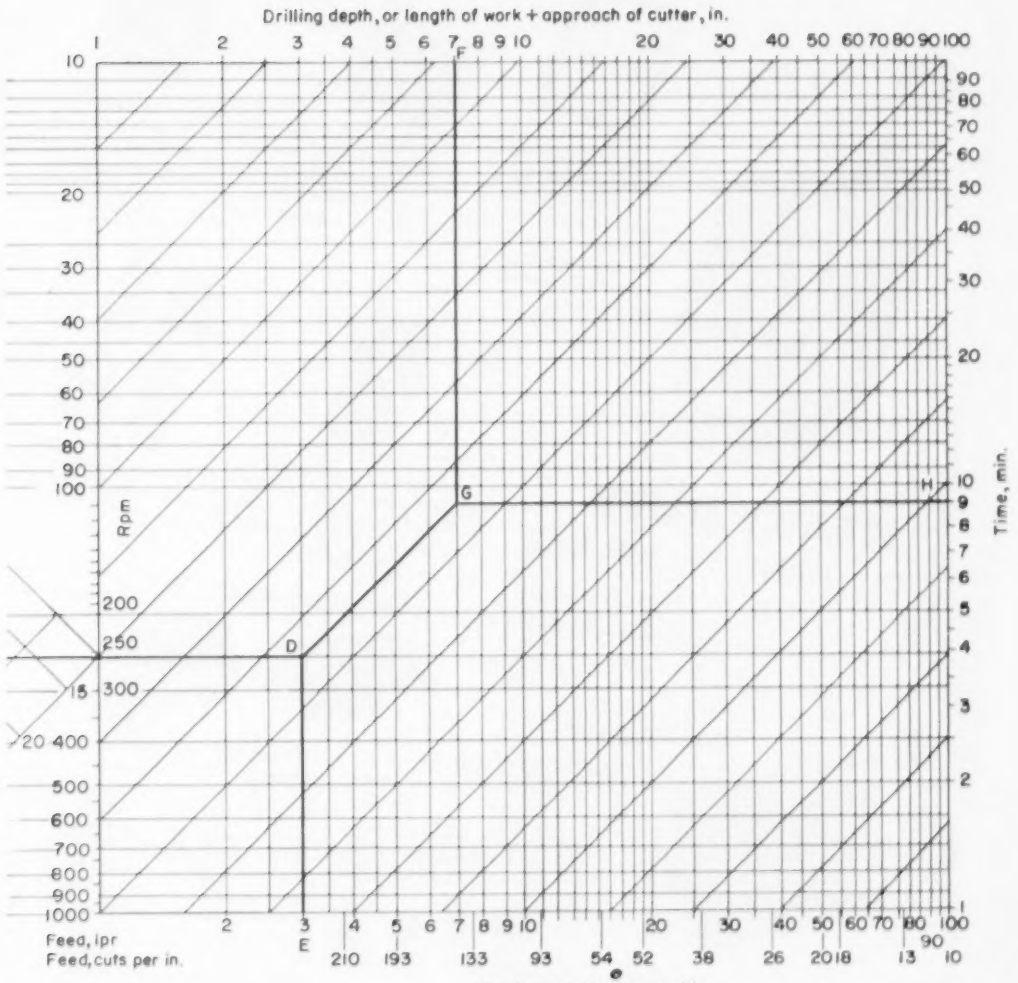
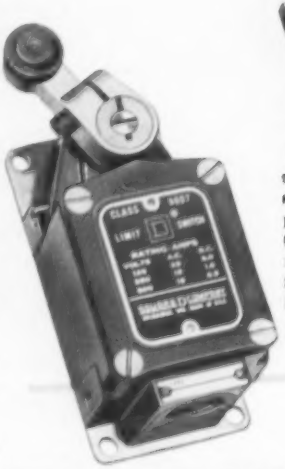
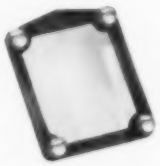
PRODUCTION MACHINING CHART... II



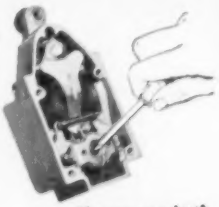
SQUARE D LIMIT SWITCHES

DESIGNED TO DO HUNDREDS OF JOBS... Better!

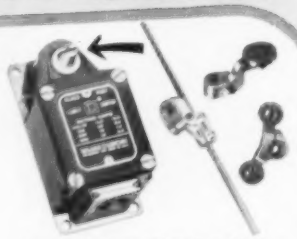




Instant visual inspection of mechanism through transparent plastic cover (optional). A tremendous time saver in multiple switch installations.



Eleven contact arrangements in one switch...and all you need to make the changes is a screwdriver!



Simplified stocking because basic switches and a wide variety of lever arms are packaged separately. Moderate stock handles a multitude of combinations.

Continuously adjustable operating lever arms permit an infinite number of adjustments. Up to 80° overtravel reduces arm breakage.

Easy mounting and interchangeability through wide variety of base plates and side mounting holes.

HEAVY DUTY

OIL-TIGHT • Class 9007, Type T

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OIL-TIGHT

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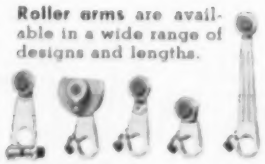
Small precision limit switch available in three forms—basic contact mechanism, flush or surface mounting. Both flush and surface mounting switches are available with varying lengths of roller arms and with rollers of different types and sizes. Also push rod operated (*shown above*) and in single unit or duplex construction.

Roller arms are available in a wide range of designs and lengths.



Write **for Bulletin 9007** *which gives the complete details of Square D's complete line of oil-tight limit switches*

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SQUARE D COMPANY

Talking Shop . . .

Long Run

In the face of varying business conditions, the load on the machine shop of Continental Foundry & Machine Div, Blaw-Knox, East Chicago, Ind, is spectacular. The plant has been operating 24 hr a day, 7 days a week, for the past five years. About 270 men are employed, 35 of them apprentices, the permitted ratio of apprentices being exceeded with special permission of the union. The secret of 7-day operation lies in the arrangement the company has with the men, that they may work five, six, or seven days, providing only that a man taking time off does so by agreement with men on other shifts running the same machine. Each of the other men works overtime to compensate. Shop work is about half new production of rolling-mill machinery for Continental, the other half maintenance, repair, and special jobs for outside companies. Continental has the biggest equipment avaliable in the area, so many local companies sub-contract oversize jobs to this shop.

Lathe in Glass

CHURCH of the Immaculate Conception, Holyoke, Mass, has recently installed a stained-glass window that pictures a Fay turret lathe, symbolizing the kind of work many parishioners do. Daprato Studio produced the window—probably the first to show a machine tool.

Coming Steels

Before any material becomes a regular production material, it must be tested. This was the problem recently facing the Production Engrg Dept, Lockheed - Burbank. High heat-treated steel (260-280,000 psi) bars for tensile-test speciments were to be machined. Pieces were at first machined before heat-treat, but resulting decarburization interfered with detection of hydrogen embrittlement. Tests on ¼-in.-dia bars on a small lathe showed rigidity, constant speed, feed and depth of cut are the controlling factors. Speeds ranged from 115 to 300 sfpm, feeds 0.0016 to 0.0032 ipr, rake angle 0 to 3° negative, clearance angle 6 or 7½°. 500 specimens were machined from 0.02-in.-oversize round steel 4340 rod. Best tool life was obtained with 140 sfpm, 0.0032 ipr feed, 7½° clearance and 0 rake, using an automatic profiling unit to get constant feed, speed and depth of cut.

Sweeping Time

IT TAKES 8 min to sweep 1000 sq ft of office floor; 15 min/1000 ft to damp mop; 20 min/1000 sq ft to mop and rinse (2-step method); 5 hr/1000 sq ft to strip and rewax, on the average. —James A Bagby, supt of sanitation, Aro, Inc, Tullahoma, Tenn.

Maintenance Tips

FIVE bad maintenance attitudes that can be changed into healthy ones:

1. Eat, drink, and be merry—If maintenance crews don't know what they'll face next day, they're likely to be fatalistic. But in many cases you *can* figure out the next day's schedule.

2. Life is a treadmill—Performance goals aren't usually set for maintenance—but they can be, and they will provide incentive.

3. The rat-race—If maintenance crews keep fixing the same old breakdowns, somebody hasn't been properly educated, or the equipment should be tossed out.

4. Remember the Depression—Proving to maintenance people that their job is vital can end featherbedding, stretch-outs, early quitting, and late starting.

5. Oh, promise me—Few maintenance staffs bother to follow a schedule; less stick to it. But it isn't impossible, and it boosts morale and respect.

Credit for these tips to hep shop men goes to Ervin Sheltzer, Electric Storage Battery Co, speaking at Plant Maintenance & Engineering Show, Philadelphia.

Miller Does Shaping

A vertical-miller operator at Hewlett-Packard, Palo Alto, Calif, had just finished milling slots in the castellated top of a circular aluminum casting. But his cutter left fillets in the corners of the slots. The setup was all made, so he simply replaced the cutter with a shaper tool, properly oriented, and when we saw him was busily running the hand feed lever up and down to get the desired square corner. It was fast, accurate and simple, even if the miller maker might not approve.

Sprayed Repair

Piston rods for large horizontal gas engines ("blow tubs") of the Gary Works, US Steel Co, wear rather rapidly in service. Rods are either 12 or 14 in. in diameter by 18 ft long, and greatest wear occurs for 5 or 6 ft to either side of the central piston. Chromium plating was tried to build up worn areas and reduce wear, but failed to help much because of lubricating difficulties. Jack Kennedy, supt of Continental Foundry & Machine Div, Blaw-Knox, East Chicago, Ind, found a solution in metalspraying. Worn areas of piston rods are rough-turned down, then built up for 8 ft each side of the piston with Ascoloy 22 in many shallow passes of about 0.002 in. each. The coating is ground to size and lubricated. Porosity permits penetration of the coating by the lubricant, so rods now last as much as 17 months without attention.

News of Metalworking . . .

ASTE Convention Agenda: From Ceramic

CHICAGO—The ASTE people are saying this will be the biggest Tool Show in history—both from the standpoint of number of exhibitors and floor space involved—with upwards of $11 million worth of metalworking machinery and equipment on view when Chicago's International Amphitheater opens its doors March 19 for the 24th Annual Convention and Show of the American Society of Tool Engineers.

Industrial conferences will feature some 60 papers on new developments in metalworking processes and equipment while the Show is in progress. And 14 Chicago area metalworking plants will be open for plant visits.

Ceramic Tools

The Society's industrial conferences will open Monday, March 19, designated "New Materials Day," with a two-part session on ceramic cutting tools—the first on developments at Watertown Arsenal, and the second on cemented borides. Following session will cover drawing of titanium, and ultrasonic machining. A third session will take up recent advances in grinding wheels and production grinding machines, plus a talk on electrical discharge grinding. Winding up on Monday's technical program will be a dinner symposium at Illinois Tech's Commons Building on shaped diamond tools. J S Gillespie, manager of GE's artificial diamond project, will be the speaker.

Tuesday, March 20, ("Research Day") will continue the shaped diamond tool symposium with talks on diamond crystallography and grinding hardness, and the manufacture of shaped diamond tools. A concurrent 9:30 am session on "Automating the Individual Machine" will take up numerical control and use of punched cards. At 10:30 am, the economics of machine tool buying vs renting will have MAPI Research Director George Terborgh as the pro-buying advocate, and President Francis J Trecker of Kearney & Trecker as the pro-leasing speaker.

Third continuation of the diamond tool symposium will be held Tuesday afternoon, and will cover diamond dressing of form grinding wheels, shaped tools for formed grinding, and diamond tool shank suggested standards. A 2:30 pm session on plastic tooling will open with a paper from Chrysler on its advantages, and a follow-up interview by three experts from industry.

Metal Cutting

Tuesday evening, cutting fluid application and metal cutting evaluation will be discussed in the Conrad Hilton Hotel's Beverly Room. At the same time, the Hilton's Waldorf Room will have a session on carbide die problems, covering electrical discharge machining, aiding the die builder, strip steel manufacturing, and die applications of cemented tungsten carbides.

Part 4 of the diamond tool symposium will open Wednesday ("New Processes Day") technical sessions, and will cover various applications of diamond tools to turning, shaping, boring and reaming. Low-cost

No Such Thing as "For Civilian Use Only"

WASHINGTON — Removal of the embargo on shipment of certain strategic machine tools from western nations to Russia and her satellites is helping the Soviet build up armament production. That's the charge made at a recent hearing of the Senate Investigations Subcommittee by Ralph E Baldenhofer, executive vice president of Thompson Grinder Co and former director of the Metalworking Equipment Division of Business and Defense Services Administration.

The Paris Agreement

The Subcommittee has been probing the effect of the August 1954 Paris Agreement between the United States and 15 other free-world countries to relax controls on exports of strategic goods behind the Iron Curtain. The agreement was pushed by the British government.

A number of British manufacturers, including machine tool makers, visited Moscow in 1954 and booked orders for Soviet delivery, subject to procurement of shipping licenses.

Non-Strategic?

The most important machines involved in easing of the embargo were horizontal boring, drilling and milling machines, Mr Baldenhofer told the Subcommittee. These machines, he said, can be used to make automotive dies, but they are also indispensable to the production of heavy ordnance parts, aircraft forging presses, catapult parts for ships, atomic reactors and marine turbines.

One Machine Already Delivered

One of these machines has been delivered from Britain to Russia this year, Mr Baldenhofer revealed, and five other machines are on order. These machines have 8-in. bar capacity or over. The Russian order for the machines was placed less than 30 days after signing of the Paris agreement.

The following machines can now be shipped to the Soviet bloc, Mr Baldenhofer said:

- **Precision boring machines** capable of making radar control mechanisms, jet-engine fuel pumps and guided missile components. These machines are strategically more critical than jig borers, which are still on the embargo list.
- **Large vertical boring mills** used in making jet-engine frames, guided missiles and marine turbine gears.
- **Hydraulic and mechanical presses** for producing aircraft fuselage forgings and shell casings.
- **Surface grinder under 24 in.,** that can be used in making jet-engine parts, guided missiles, radar, diesel engines and fuel pumps.
- **External cylindrical grinders,** Mr Baldenhofer added, could be shipped to Russia without cambering devices, but the Russians could put these devices on the machines.

The British, who favor relaxation of the embargo, argue that if a ma-

Tools to Machine Buying vs Leasing

output of fine pitch gears will be the subject of another morning session, which will take a look at gearing and automation.

Session on electronic calculators at 10:30 am Wednesday will outline uses of computors as machine tool controls, and will have a talk on GE's machinability computor.

Final session of the diamond tool symposium will cover cemented-particle diamond tools, selection of diamonds, and cutting of ceramics and carbides.

Tooling for Automation

The effects of automation on jigs and fixtures will be discussed in a 2:30 pm Wednesday session, with A V Bodine, president, Bodine Corp, and H M Adams of Chrysler as the speakers.

Discussion on the why and how of surface finish will take up newest developments in inspection and production. Concluding Wednesday session will be held at the Amphitheater at 8:00 pm on the intriguing subject of "Automation—You Can Afford It!" Ralph E Cross of the Cross Co will discuss automation for the big production shop, and Convair's J B Cunningham will talk on automated electronics.

Thursday, March 22 ("Management Day") will open with a 9:30 am conference on "Fluid Power Today," co-sponsored with ASTE by the National Fluid Power Association. Session on metal cutting research applications at 10:30 am will discuss crater wear of cutting tools, and application of research findings to shop problems.

Opening afternoon session Thursday will be a discussion of what to do about the tool engineers shortage. This will be followed at 3:30 by talks on how to cut costs through product and tool maintenance analysis.

Tomorrow's Tool Design

Final day's sessions, Friday, March 23 "Tool Engineering Day," will open with a session on tool design to meet tomorrow's competition, with emphasis on measuring productivity in tool design, and planning for new developments in gaging. The need for new tool standards, including the new ASTE-recommended carbide tool tip standards, will come in for discussion at the 10:30 am conference.

Friday afternoon session at 1:30 will have speakers from Alcoa's Cleveland Forge Plant, and Kaiser Aluminum's Heavy Press Extrusion Plant telling about problems encountered in tooling up the world's biggest presses. Wind-up of five days of conferences will be a session on soluble oils and cutting fluids in machine tool operations.

Extensive Plant Tours

Plant visits during the five-day convention and show will include tours to Motorola Inc, U S Steel's South Works, Armour Research Foundation, Skil Corp, Ford's Aircraft Engine Division, Scully Jones & Co, Hotpoint, Kropp Forge, International Harvester's Melrose Park Works, GM's Electromotive Division, Sears Roebuck's Testing Labs, and Verson Allsteel Press Corp.

Machine Tools for Russia, Senate Told

chine can be used in civilian production, it is not strategic. The U S State Dept sides with British on this—over the protests of the Commerce Dept and the Pentagon, Mr Baldenhofer said.

Russian Copycats

The small dollar-volume of machine tool trade resulting from easing of the embargo, he declared, is not important. The point is that the Russians can order one or two machines, copy the models and produce the machines themselves. Mr Baldenhofer reported seeing Russian-made machines at European trade fairs that were indistinguishable from U S-built machines.

U S Builders' Embargo?

In recommending that no machine tools be shipped to Russia from the West, Mr Baldenhofer made the sweeping comment that "no machine tool built today will do only war work and cannot be used for civilian goods manufacture, and vice versa."

He believes that the current embargo list is so full of loopholes that it is not worth the paper it is written on. Even if the embargo were lifted altogether, he would not, and he thinks other U S builders would not, ship machine tools to Russia.

Pentagon in Agreement

Mr Baldenhofer's contention that the Russians will get more value from machines they import from the West than the equipment's actual cost was borne out in the testimony of John Williams, chief of the Defense Dept's Production Equipment Division, who said that by copying foreign-made models the Russians can avoid the usual 3-5 year cycle needed to perfect a new machine.

Mr Williams expressed the opinion that the lifting of the embargo on certain types of machines "facilitates the concentration of manpower in making the military end-item, rather than in building the machine itself."

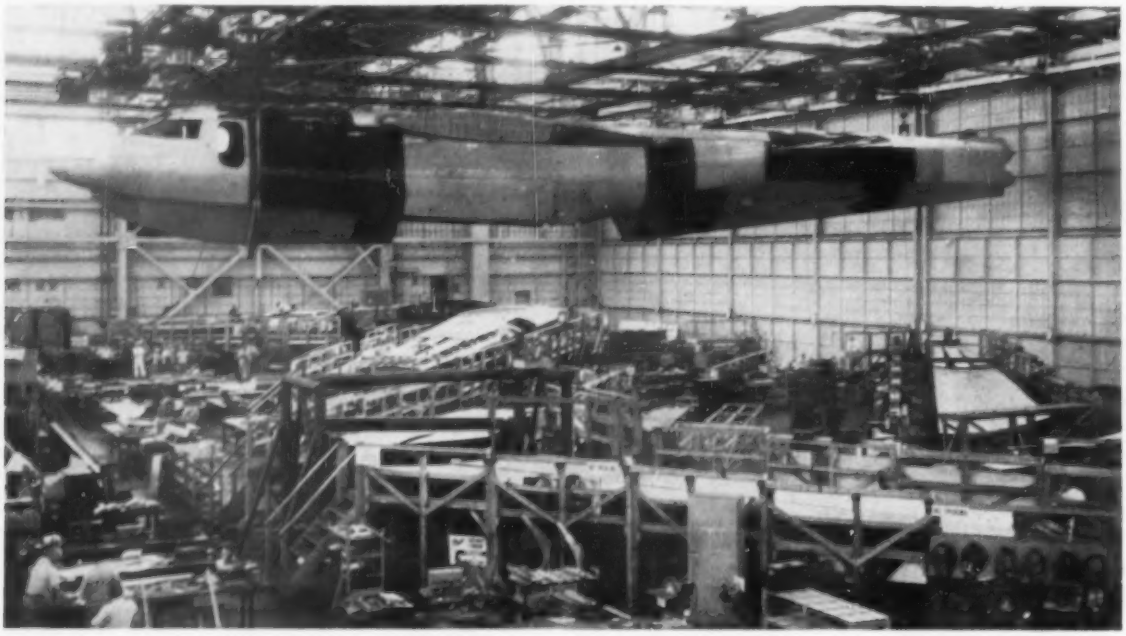
He opposes shipment of machine tools to Russia because "machine tools are used to reproduce themselves . . . and I doubt whether any machine is not utilized in production of a military item."

Britons Ask 215 Licenses . . .

The Senate subcommittee released information showing that British machine tool builders applied to the British Board of Trade for 215 licenses to ship tools valued at $77 million to the Russian bloc in the period from December 1953 to October 1954.

. . . and Get Okay on 177

Sixty-one licenses worth $2 million were immediately approved. The other 154 cases were held up. But in the month just before and after the Paris negotiations, 116 licenses worth $31 million were sanctioned.



SEAMASTER HULL MOVES INTO FINAL ASSEMBLY POSITION at Glenn L Martin Co's Baltimore plant. Wings are assembled so they can be attached to hull without being moved out of their fixtures

New Approach to Prototype Production Helps Martin Cut Costs on the SeaMaster

BALTIMORE—A saving of 25% under usual prototype construction costs was achieved here recently in building the first XP6M SeaMaster at Glenn L Martin Co. This was accomplished by:

- Including design requirements for volume producibility in experimental designs.
- Scheduling the prototype through regular production channels.
- Adapting existing equipment rather than purchasing new machines. Only a few exceptions this rule were necessary.

Assembly in Sectional Fixtures

A 600 mph seaplane, the Martin SeaMaster has a designed cruising altitude of 40,000 ft and a 30,000 lb payload. Production models will be assembled in sectional fixtures rather than the single hull dock usual for seaplanes. Forgings and castings were extensively used in the first model rather than the usual method of milling experimental parts.

Navy specs called for skins to be drilled and trimmed before anodizing, adding about 30% more surface and requiring unusual anodizing facilities. An old anodizing tank was moved close to an installed generator, enlarged to take the 800-lb skins. The floor had to be shored up to carry the load of the tank, the large volume of anodizing solution, and the weight of the parts. Then experimental tests were made to revise the process schedules to make sure the anodize would meet specifications.

Contour Milling Attachment

A tongue-and-groove bolted joint in the thick wing skins supplements the usual bolted fittings in attaching the wing to the wing stub of the hull. To hold the close tolerances required in this joint, a wing-root end gage was made with the airfoil contours machined by a special contour milling attachment mounted on a planer. A bracket was clamped to the traveling head of the planer carrying a hinged arm with a motor-driven milling cutter and a follower cam. The cam rode on a loft templet, guiding the cutter to the exact airfoil outline as it cut the end gage.

A portable milling machine was then developed to cut the surfaces of the joint. The machine is mounted on a track attached to the end gage and has a cam that follows the contour previously cut in the end gage. By changing the cams, the finishing cuts can be made on both top and bottom of the tongue and top and bottom of the groove, both of which follow the contour of the wing skin.

Machining Honeycomb

Difficulty was encountered in producing bonded honeycomb structures of unusual configuration. Fin and stabilizer surfaces have a pan-type sheet metal inner skin into which the honeycomb core is laid and bonded. When the outer skin was laid on, it was found that the inner skin could not be formed accurately enough to provide a consistent glue line at a reasonable cost.

The problem was solved by machining the honeycomb core to the exact height of the flanges on the pan after it was bonded to the inner skin. A special mushroom-shaped milling tool was developed for this operation. Later the honeycomb core was leveled with a band saw, but the milling cutter is used to cut recesses for doublers and inserts.

Profits Probe Stirs Tool Policy Ruckus

WASHINGTON—The current Congressional probe of military aircraft profits will include a look into the Defense Dept's tool replacement policies.

Rep F Edward Hebert (D, La), chairman of the House Armed Services Subcommittee conducting the profit investigation, made the statement after Fairchild Engine & Airplane Corp's Vice president, Arthur F Flood, charged that his firm has to pay for equipment to replace worn-out machine tools owned by the Air Force. Said Flood: "There is no replacement program for government machine tools."

Reserve Tool Policy Under Fire

The industry charge and Hebert's plan come on the heels of an earlier Congressional investigation into the Defense Dept's new Reserve Tool Policy at which Pentagon officials said the new policy will be a spur for modernizing military production lines (AM Feb 27 '56, P 172).

Hebert says his probe is aimed primarily at finding out "what the gap is between the amount paid for military aircraft by the government and the actual cost of those planes to the companies," and "If the companies are making a fair profit or if the government is paying too much."

Up to now, his committee's findings have not been conclusive. It has heard a defense against the charge of excessive profits and a plea for larger earnings. And it has seen some dirty linen put on the line. For instance, it has heard:

- North American Aviations's president, J L Atwood, compared his company's 3.3% profit on gross sales over the past nine years to the national manufacturing average of 6.4%. He said military plane-makers' profits are justified considering the industry's "unusual business risks."
- Boeing Airplane Co President William M Allan argues that bigger profits should be allowed on military plane contracts. He said Boeing has plowed back 70% of its earnings into 'acilities expansion, compared to the general industry average of 45%.
- George M Bunker, president of Glenn L Martin Co, says that Korean defense contracts pulled his company out of the red. Right now, 99.7 % of Martin's production is for the government; in 1952, the rate was only 69.5%.
- Fairchild Engine & Airplane Corp's vice president, Arthur F Flood, admitted that the firm employed six retired admirals and generals last year, but said none of them solicited business from the military services. He also defended Fairchild's bonus program against congressional criticism that "fabulous" bonuses have been charged to the government.
- Grumman Aircraft Engineering Corp President Leon A Swirbul admitted that over the past six years the company has charged the government $688,403 for dues and contributions it made to educational and charitable organizations.

It's still too early to tell how the investigation will come out—how if at all it will affect defense contractors' profits. Most aircraft makers tend to dismiss it as politically-inspired. They consider the Democrat controlled probe part of the election-year attack on the Eisenhower administration.

Look for New Proposals

But it's possible that you will see some new legislative proposals coming up to limit defense profits.

Among the likely proposals: (1) uniform standards on negotiated contracts, setting forth profit allowances based on sales volume and private capital investigated or a weighted average of the two; and (2) tighter restrictions on how much overhead charges—bonuses, advertising, contributions, and the like—companies doing the bulk of their business for the government could charge off as contract costs.

One of the Hebert Subcommittee's major objectives is to develop a firm yardstick to measure the profitability of military aircraft manufacturers. But right now, there's no ready answer. The Air Force, for instance, steers clear of telling what its target for a reasonable profit allowance is. Says one procurement official: "You'd be a dead pigeon in your negotiations if you stated a definite figure." But the Air Force is working up a study to show that average profit has been earned on its contracts. Presumably, this will be made public later on.

The aircraft companies contend that their return on gross sales is the most meaningful profit measure. The industry averaged 2.5% on defense contracts since World War II. During the same period, the aircraft makers point out, such companies as General Motors realized an 8.15% return on sales, Dupont 17.14%, Standard Oil of New Jersey, 11.88%, and US Steel 5.88%.

But Congressional critics—and the Renegotiation Board—Play down the importance of relating profits to sales in military aircraft production. Their stand is that most of the producers' plant and equipment is government-owned. For instance, 80% of Boeing's facilities and 77% of North American's belong to the Air Force. These critics favor return on net worth as a more significant measure of profits.

The aircraft makers, however, charge that return on net worth is not a fair criterion either since it doesn't reflect such factors as these: (1) technical know-how; (2) the industry's traditional low net worth in relation to production requirements because of the industry's feast-or-famine characteristics; (3) the industry's nature as a rapidly growing one whose net worth can't be compared with older and more stabilized industries.

Special Aircraft Risks

In general, the aircraft makers claim they don't like to be treated as wards of the government dependent on handouts from Washington. Only out of high profits, they argue, can they expand facilities. But most important of all are the special risks faced by the industry. North American's Atwood outlined these this way:

- Dependence on a single large customer and a violently flucuating market.
- "Intense competition for available business . . . oriented primarily toward design capability."
- "The sharply accelerated rate of technical progress . . . (has increased) competitive hazards . . . (and) accelerated obsolescence of development and production facilities."
- The industry's long lead-time cycle, which "magnifies competitive hazards," and its highly specialized facilities.

Share-New-Business Plan Pays Off

THE FORMULA: pool the sales, engineering and production talents and facilities of several goodish-sized and widely diversified metalworking and plastics firms. Result: as much as $2.5 million in new business in a single month — mostly in orders that none of the 18 firms that make up this Los Angeles combine could have unearthed on their own or could have handled individually

LOS ANGELES — Industrial Manufacturing Services Co is a name to be reckoned with in West Coast metalworking. Probably the most widely diversified outfit in the entire West, IMSCO commands the combined talents and facilities of 18 good-sized ($1.5 to $10 million annual business) metalworking and plastics firms covering tool and die-making, steel casting, heat treating, brazing and plating, plastics molding and extrusion, stamping, and electronic parts manufacture.

IMSCO applies the cooperative approach not only to getting leads on new business, but to just about everything that goes into running a manufacturing concern—sales methods, production techniques, industrial relations, and new product development—to the tune of anywhere from $250,000 to $500,000 a month in new business for its 18 members. One month the total was $2.5 million in new orders!

Started Four Years Ago

It all started four years ago when a couple of salesmen fell into conversation while waiting in the lobby of an aircraft plant.

Said one salesman, "I just got back from a wild goose chase. Trying to sell steel castings to an outfit that has no use for them. But if we were set up to make an aluminum die-cast wheel, I could have sold them a million."

The other salesman was Dodd Mauldin, sales manager for a Los Angeles die-casting firm. Needless to say, he took off like a comet and got the order.

That set him thinking. What if a group of non-competitive manufacturers could set up a kind of mechanism for exchanging such orders? The more he thought about it, the more of a natural it seemed. Mauldin talked it around, wound up forming six firms into Sales Contact Co (the name was changed to Industrial Manufacturing Services Co last year when its scope was broadened into production).

Today, Mauldin's idea is really paying off for the 18 companies that make up IMSCO, for example:

A member was tipped off by a fellow member's salesman that a company he'd visited was looking for someone to make an auto seat belt spring. Resulting order: $200,000 a month on a one-year contract.

Sometimes a tip from a fellow member brings new business even from an established customer: a member had been doing lamination heat treatment for a customer. A member company's salesman heard that the customer was having trouble with the contractor annealing its castings. The first company followed the tip, got the business.

A fast-expanding company had morale and supervision troubles. IMSCO combined its talents, saw what the firm involved couldn't see — that trouble came from promoting men from the ranks without sufficient training. And jobs needed better description, responsibilities, should be more closely defined, and better communications should be established. The member company applied IMSCO's suggestions, quickly solved its problems.

IMSCO's staff found an inventor who had a small weaving gun a housewife could use in making hooked rugs easily and quickly. Result: IMSCO will shortly start production of the guns for a yarn company that will distribute them as a promotion device.

Secret of Success

Why has IMSCO succeeded where so many similar co-ops have failed? To find out, *AM* recently paid a

IMSCO Executive Session

PLANNING NEW COOPERATIVE MOVES FOR IMSCO at a recent session in Los Angeles are left to right: IMSCO President Harvey Stowers; R R Dreibus, vice president of Harvill Corp; A W Vienna, president, California Spring Co Inc; and R P Archer, president, California-Doran Heat Treating Co. All three of the companies represented were among IMSCO's six charter members

call on IMSCO President Harvey Stowers, who heads a staff of three: an assistant to the president, a director of engineering, and a secretary. This, he said, is how IMSCO has succeeded:

- Member companies' salesmen report leads their own firms can't handle to the IMSCO office, where they are passed on to interested members. A yearly contest with cash prizes for the most leads resulting in new business stimulates such reporting.
- IMSCO has a list of 600 companies that call on it with requests for bids. When these companies need a second source, they think of IMSCO. It's convenient. IMSCO even contacts non-members when a tip comes in that no member company can handle.
- President Stowers and his assistant, Ed Chandler, constantly expand the list. Both have broad local contacts. Chandler spends most of his time visiting potential customers, gets to know the people who have buying say-so, acquaints them with IMSCO.
- Sales ideas are exchanged, as well as business leads. For instance, all member sales managers hold a monthly round table in which they kick around ideas, discuss each others' problems. The round table's steering committee asks the IMSCO staff for such services as a sales and human relations program, or a current sales training clinic that takes 12 weeks and is attended by 127 salesmen.
- Advertising and promotion get cooperative attention, too. Most of the firms lack a full-time ad manager, so they profit from idea swaps, and from the advertising and public relations outfit retained by IMSCO.
- IMSCO's Director of Engineering helps member firms with production problems. Sometimes he visits the plant, makes an analysis of the problem, then calls on other member firms who have overcome similar problems. Maybe 10 people will get together to lick a tough production problem.
- IMSCO has an open door for any inventor looking for a manufacturer, but only if he has a patent or has applied for one. If it seems to have merit, all member company presidents decide which firm is best qualified to handle it. The director of engineering may help in redesigning the product, but the arrangement between the inventor and manufacturer is entirely up to them. IMSCO's job is simply to bring them together.
- IMSCO benefits its members in any number of other ways. Take sales contacts, for instance. If a member sales manager thinks a firm has some business for him, but doesn't know anyone there, he calls Stowers, who scouts around among the other members. Maybe he finds out that one of the member presidents plays golf with the purchasing agent of the potential customer. Presto, a personal introduction eases the way.
- Then there's the monthly IMSCO Newsletter. It goes to a selected list of 2000 member and non-member companies, and contains information about new members, facilities and achievements of members, new contracts, and activities of companies and their officials.
- Another IMSCO tool is a monthly breakfast meeting of its member salesmen. They get a chance to meet each other, find out what the other companies can do.

That's how IMSCO works. Here's why it ticks so successfully:

- New members are chosen with care. Present membership of 18 is about right. "Shouldn't go over 30 anyway," Stowers says. New members are carefully screened for financial soundness, plant, ability to deliver on schedule, quality of product, etc.
- It's a strict rule that no two members can be competitive. That's why when an aluminum die-casting lead comes in, or plastic molding, or what have you, there's no friction over who follows it down.
- Members are encouraged to buy from each other, and considerable business goes on within the IMSCO family. But there's no compulsion. A member gets a chance to bid if a fellow member has a contract to let, but if he's outbid there are no hard feelings.
- IMSCO operates on a flat annual fee of $200 per member, which it believes is better than a percentage-of-business-obtained-through-its-services fee. All members are treated equally. There can be no question of corporate profiteering. That's one of the greatest hurdles IMSCO had to clear — outsiders thought they were dealing with a group of "5 percenters" until otherwise convinced.
- Membership is purely voluntary, and companies can withdraw at any time. There are no contracts. A few companies have dropped out, but seldom from dissatisfaction. One firm joined, got $300,000 worth of business its first month, and dropped out. That was a mistake IMSCO won't make again. Its member companies today are all solid, reputable and reliable — prime ingredients in in this successful cooperative effort.

New-Business Gimmick

THE QUARTER IS THE ATTENTION-GETTER ON THIS REPLY POST CARD. It's sent out by IMSCO whenever the co-op hears of a new firm that might have some business for its members. Return on the cards is an impressive 85%. Checked information is then distributed to members as a valuable sales aid

Field Report USA:

East...

Eastern briefs . . .

International Business Machines has a $10-million Air Force contract to make M A-2 bombing navigational systems. Work will be done at the Poughkeepsie, NY, plant . . . **Bridgeport** (Conn) **Brass Co** and **Hunter Aluminum Corp** are merging. Hunter has plants in Riverside, Calif, and Flemington, N J . . . **Allegheny Ludlum Steel Corp** is installing a 2000-ton forging press for hot working high-alloy tool steels at its Dunkirk, N Y, works . . . **Westinghouse Electric Corp** will build a multi-million-dollar electric stairway plant near Dover, N J. It will have 250,000 sq ft of working area, will employ 200, and will be in operation early next year . . . Non-manufacturing employment in New York State hit an all-time high of 6,115,600 in December . . . **Techalloy Co Inc** has made a 10,000-sq-ft $250,000 addition to its Rahns, Pa, plant, tripling the firm's annealing capacity for stainless . . . **Bendix Aviation Corp** is going into production of transistors at its Red Bank, N J plant . . . **Farrand Controls Inc,** Bronx, NYC, will manufacture and distribute the Inductosyn line of automatic control equipment . . . **Circo Equipment Co** plans to double the size and facilities of its Rahway, N J, metal degreasing and metal washing machinery plant at a cost of $100,000 . . . **R Hoe & Co Inc,** New York printing machinery maker, has signed two-year contracts with the seven unions that make up its work-force . . . 200 firms are slated to exhibit components, materials, finishes, shapes, forms and services for design-engineers at the **Design Engineering Conference** in Convention Hall, Philadelphia, May 14-17.

West...

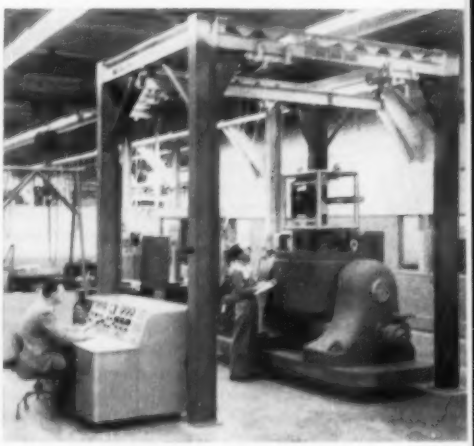
Around the West . . .

First West Coast-built nuclear submarine (fifth of the Nautilus type) had its keel laid February 21 at Mare Island Naval Shipyard. It'll be named the U S S Sargo . . . **Hewlett-Packard Co,** Palo Alto, Calif, electronics firm, has leased a 40-acre tract there for a new plant . . . Rheem Mfg Co has added four new plants to its string (boosting the total to 18) through merging with **Richmond Radiator Co,** maker of plumbing fixtures. It's a new field for Rheem . . . **Motorola Inc** will spend $3 million to expand its military electronic equipment research and production facilities at Phoenix, Ariz. Plans include a new 150,000-sq-ft plant (Motorola's third in Phoenix) for manufacture of transistors. It will employ 1000—400 engineers, 600 assembly and production workers . . . **Todd Shipyards Corp's** Los Angeles Division is making its comprehensive Thermit welding facilities available to industry for repair and fabrication of heavy sections of ferrous metals . . . Hard on the heels of **Boeing's** announcement that it will spend $8.5 million for a new plant at Renton, Wash, comes news that the company will spend $21 million on a developmental center near its main plant in Seattle. It will include more than 1-million-sq-ft of floor space, devoted to Bomarc guided missiles, physical research, structural testing and experimental activities. It's possible a supersonic heavy bomber, successor to the Boeing B-52 Stratofortress, may be built here eventually . . . **Wellmade Metal Products Co,** Berkeley, Calif, maker of metal building hardware, has been bought by E C Bergen, former manager of manufacturing for Rheem Mfg Co; Thomas A Kelly, ex-Rheem chief engineer; and William H Johnston, a general partner in Wellmade . . . **Tubing Appliance Co Inc** has sold its line of TAC ratchet wrenches to **Plomb Tool Co,** which will move manufacturing operations to its PROTO plant in Los Angeles . . . **International Telemeter Corp** (owned by Paramount Pictures Corp) has formed a subsidiary, **Telemeter Magnetics and Electronics Corp,** by absorbing **Wendt-Squires Inc,** Buffalo, N Y. The new company will make data processing machines and memory components.

Midwest...

Detroit briefs . . .

Hudson, generally forgotten in the share-of-the-market race of the giants, is running better than 6% ahead of its January-February 1955 pace, in this off year . . . **Chrysler** and **Ford** are both putting transistor radios into their top nameplates, and hybrids (transistors replacing hi-voltage circuits) in their low-priced lines . . . It looks as if **Chevvy** is girding for its talked-about 3 million cars a year output. Chevvy will build its biggest assembly plant in Northeast Ohio . . . It will have a 75-car, and 30-truck per day output, will be Chevvy's 13th assembly plant . . . **Mercury** will build its own station wagon plant alongside its Wayne, Mich, plant. It will cover 352,000 sq ft, will turn out 250 bodies a day. This means **Mitchell-Bentley's Ionia Mfg Co** will phase out on Mercury station wagon body output with introduction of '57 models. But Mitchell-Bentley has an ace in the hole and isn't too worried over the loss. It'll produce a station wagon for **Oldsmobile** . . . **Studebaker** is going in for output of police cars and taxicabs, with a lot of special equipment on each . . . **Ford** is eyeing Indianapolis as the site for its new steering gear and cold-heading plant, is just waiting u..il sewer, water and road services are ironed out. The plant would bring a $15-million-a-year payroll to the Hoosier capital, employing 3000 people to turn out, among other things, 6 million cold-formed parts a day . . . **Chrysler** says it's increased use of



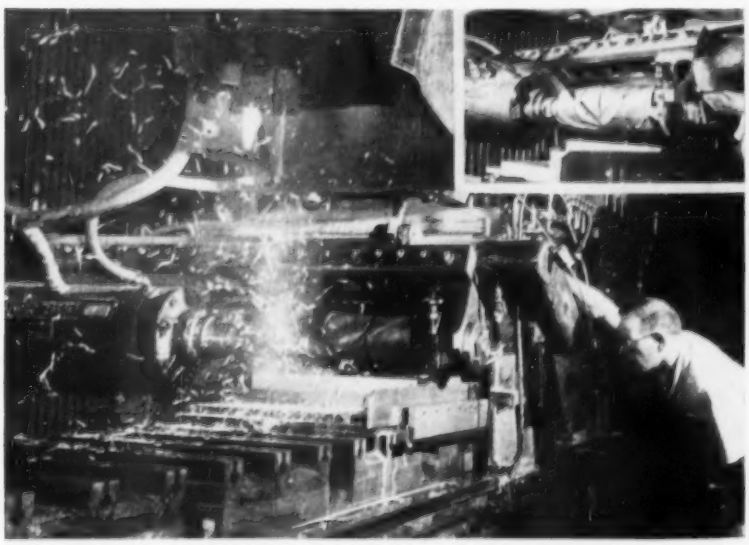
The Big Shaker

WEIGHING 9 TONS, this electro-dynamic vibration exciter, known around North American Aviation's Downey, Calif, labs as the "Big Shaker" can subject test equipment for jet aircraft and guided missiles to 45 times the force of gravity. Its rated force output of 12,500 lb allows North American to simulate supersonic flight conditions

aluminum in its cars by more than 800% since 1925—its nameplates average more than 120 aluminum parts per car . . . **Chevrolet** Chief Engineer Ed Cole in a recent talk said that the next major improvements in car performance will come about through higher compression ratios, fuel injection systems and wider use of light-metal parts—long before the gas turbine comes into general use. He added that the average car will jump its current 40 lbs of aluminum to 100 lbs within 10 years . . . **Ford** is now throwing in the 225-hp Thunderbird engine as optional equipment on all '56 Fairlanes and station wagons . . . Sales battle between the low-pricers and the medium pricers has resulted in **Pontiac** upping output of its "860" to almost 39% of its total, compared with 25% in 1955, and adding two and four-door hardtops to the line. Pontiac now boasts the 860 costs only 50 bucks more than Plymouth's Belvidere and **Chevvy's** BelAir.

Elsewhere in the Midwest . . .

Eaton Mfg Co has bought out **Automotive Gear Works Inc,** Richmond, Ind, maker of Double Diamond gears, will make it subsidiary . . . **Link-Belt Co** is moving its executive offices into Chicago's fancy new lakefront Prudential Plaza Bldg . . . **Square D Co,** Cleveland, plans to spend $9 million for new plants and expansions in the next 22 months . . . **Gibson Refrigerator Co,** Greenville, Mich, has been sold to **Hupp Corp,** Detroit, will continue to make refrigerators, electric ranges, and air-conditioners . . . **National Cash Register Co,** Dayton, Ohio, will build a $2.5-million plant at Ithaca, N Y, for its Adding Machine Division . . . **General Dry Batteries Inc,** Cleveland, has converted its Memphis, Tenn, plant to production of impact extrusions for industry . . . **Timken Roller Bearing Co** has cut back auto bearing production at its Bucyrus, Columbus, and Zanesville, Ohio, plants to four days a week . . . **Crosley & Bendix Home Appliances Plant** at Richmond, Ind, chalked up a factory safety record of 3-million manhours without a lost-time accident recently . . . **Precise Products Corp** has moved into a new, 15,000-sq-ft plan at Racine, Wis, upping its tool output 100% . . . **Armstrong-Blum Mfg Co,** Chicago, has bought the plant next door, doubling space for manufacturing sawing machines and blades . . . **Frank G Hough Co,** Libertyville, Ill, is adding 55,000 sq ft to its tractor-shovel manufacturing facilities . . . **Hotpoint Co** will go in for manufacture of TV sets, black and white only, 14 to 24 in. screens, in July . . . **Universal Match Corp** has formed **Impax Inc** at St Louis to produce aluminum impact extrusions for industry . . . **Ohio Electric Mfg Co,** Cleveland, has acquired **Kingston-Conley Inc,** North Plainfield, N J, manufacturer of electric motors and electric rotating apparatus, will operate K-C as a wholly owned subsidiary.



This Is the "Lockheed Lawnmower" . . .

. . . **SO NAMED BECAUSE OF ITS METAL-ROUTING ABILITY** takes a bite out of an aluminum slab with its oversize carbide-tipped cutters, milling the slab down to a precision-ground wing skin for a new Super Constellation. The 22-in. cutters (inset) were built in 14 days instead of the normal 16 weeks to help Lockheed maintain close production schedules. The cutter-builder, Union Twist Drill Co, Athol, Mass, couldn't get the cutters to New York by plane for transcontinental air shipment because of storms and flood conditions, so UTD's office manager did nine hours of fancy cross-country driving, skirting road and bridge washouts, delivered the cutters at the Newark, N J, airport with minutes to spare before the plane took off

South . . .

Around the South . . .

While Dixie's textile mills, sawmills, and shoe manufacturing industries will be seriously affected when the new Minimum Wage Law goes into effect, metalworking won't feel the higher wage pinch at all. Metalworking and primary metals plants have consistently paid the highest wages in the South, well over the minimum . . . Look for **Howard Hughes** to build a multi-million-dollar plant somewhere between Miami and Palm Beach, Fla. Local betting is that it'll be a ballistics missile manufacturing operation . . . **Carolina Alumnium Co,** Badin, N C, is seeking FPC okay to build a $113-million hydroelectric plant on the Yadkin River. Project, to be known as Tuckertown, would supply power for the company's aluminum smelting works, would have a 1255-ft-long dam, and a nine-mile-long reservoir . . . More than $33 million worth of plant expansions were slated for the Southeast in January alone . . . **Convair** has selected 21 companies as subcontractors for its output of B-58 supersonic bomber . . . First production model of the **Lockheed** C-130 Hercules, built at Marietta, Ga, was delivered to the Air Force recently at Elgin AFB, Fla, where it will undergo tests in the Air Proving Ground Command's climatic hangar—a huge "refrigerator-oven" that can subject the ship to temperatures from –65 F to 165F.

James F O'Donnell (left), has joined Goddard & Goddard Co, Detroit, as production manager. **Harold Thom,** head of the milling cutter department, has been named factory superintendent

Joseph P Crosby, vice president and director of LaPointe Machine Tool Co, Hudson, Mass, has been named director of the Metalworking Equipment Division in the Business and Defense Services Administration of the Commerce Department. He succeeds **Niels A Olsen,** who will continue as assistant director

Names in the News...

William F Fritz, formerly chief engineer for Acme Machine Tool Co, has been appointed plant superintendent of Boye & Emmes Machine Tool Co, Cincinnati, Ohio.

H John McGaffigan, formerly manager of industrial engine sales for Lycoming Division of Avco, has been named manager of sales for the machine products division of The J B Beaird Co, Shreveport, La.

Leo H Marsh has been appointed manager of the manufacturing engineering department of Ford Motor Co's Tractor & Implement Division. Prior to the appointment he was supervisor, process and design section of the manufacturing engineering department of the company's Tractor Plant at Highland Park, Mich. **Ernest W Kuzma,** purchased parts representative in the quality control department, has been promoted to manager of that department.

Dan T Bradley, engineering vice president of Harris Products Co, a subsidiary of Clevite Corp, has been named to the newly created post of vice president in charge of engineering and sales.

Carl O Hedner, sales manager of hoisting equipment for Yale & Towne Manufacturing Co, has been named assistant general sales manager of the company's Materials Handling Division.

Joseph P Crosby, newly-named director of the Metalworking Equipment Division, BDSA, has been associated with LaPointe Machine Tool Co for the past eighteen years. He is a director and immediate past president of the American Society of Tool Engineers, and a member of the National Machine Tool Builders' Association. Mr Crosby is a specialist in broaching techniques, and in training of tool engineers.

Philip Finale, formerly chief engineer, Loewy-Hydropress rolling mill division, has been appointed chief engineer of the rolling mill division of Engineering Supervision Co, New York subsidiary of Birdsboro Steel Foundry and Machine Co.

Howard U Herrick (left), president of E W Bliss Co, has been elected to the newly created office of chairman of the board; he will serve as chief policy officer of the company. **Robert Potter** (center), an executive vice president, has been appointed president and chief administrative officer, and a member of the executive committee, succeeding **J H Tredinnick** (right). Mr Tredinnick, who has resigned as an executive vice president, director, and member of the executive committee, will continue to serve as a vice president and consultant to the president

David D Wallace, assistant to the president of Clearing Machine Corp, has been appointed a vice president of the company

Merton C Grilley, factory manager of Producto Machine Co, Bridgeport, Conn, has been named vice president

B W Bogan, chief engineer of Chrysler Corp's Dodge Division, has been appointed to the newly created post of divisional executive engineer

John A Rinek, formerly associated with Avery Drilling Machine Co, Cincinnati, Ohio, has joined Heli-Coil Corp, Danbury, Conn, as general sales manager.

Leo G Jacques, former president of Motor Products Corp, has joined Allied Products Corp, Detroit, as a vice president. **Leo F Brown**, also named a vice president, was formerly associated as works manager with National Electric Products Corp, Ambridge, Penna.

David W Myers, controller of The Producto Machine Co, Bridgeport, Conn, has been named vice president.

Joseph J Langford, administrator of Radio Communications Engineering contracts at Kollsman Instrument Corp, New York, has been appointed manager of Air Force contracts.

John P Roche, executive vice president of Heppenstall Co, and **Harry W Davidson**, secretary-treasurer, have been elected vice presidents of the recently formed Midvale-Heppenstall Co. **A O Schaefer**, formerly vice president in charge of engineering and manufacturing with Midvale, has been named director of research. **Howard H Casey**, formerly vice president in charge of sales and engineering with Midvale, has been appointed general superintendent and manager of engineering for the new company. **Herman A DePova**, formerly general manager of Camden Forge Co, has been made M-H works manager, and **Derek G R Brigg**, former sales manager for Camden, is new M-H general sales manager.

Harry Bishop, Detroit area manager for MacLæan-Fogg Lock Nut Co of Chicago, has been appointed general sales manager, Industrial Division.

Robert J Dawson has been appointed manufacturing manager of Caterpillar Tractor Co's new plant in Glasgow, Scotland. He had been assistant factory manager of the company's engine factory in Peoria, Ill.

Calvin K Kirk, district sales engineer at Norton Co's Grinding Machine Division in Chicago, has been appointed to the new post of product research engineer in the Worcester, Mass, headquarters. **Emens Guernsey** has been named sales engineer in the foreign section of the grinding machine sales engineering department; **Oakley C Walker**, formerly service engineer in Europe, has been named sales and service engineer in the same department.

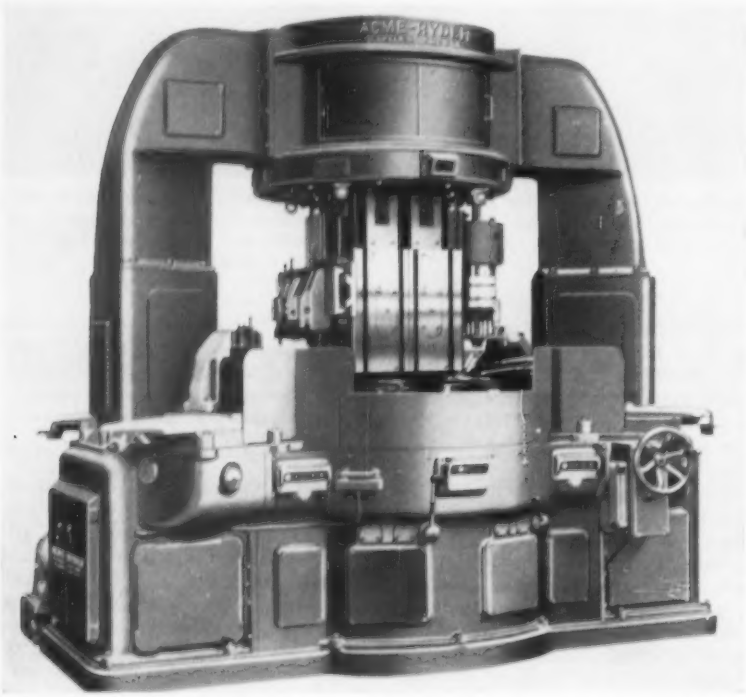
Samuel J Childs, president of Daystrom Furniture Division, Olean, NY, has been appointed vice president and general manager of Weston Electrical Instrument Corp, a Daystrom subsidiary

Joseph L Knopf has been elected vice president of Morey Machinery Co, New York. He will continue to be in charge of procurement of machine tools for redistribution

OBITUARIES

Robert A Horner, 66, retired manager of Barber-Colman Co's Machine & Small Tool Division, Rockford, Ill, died Feb 28 at the Mayo Clinic in Rochester, Minn. Mr. Horner, who had retired January 1 of this year, had been with the company for 37 years, joining following service as a Captain with the 81st Division in France in World War I. He was named divisional sales manager in 1930, and manager of the Division in 1950. He was a life member of the Metal Cutting Tool Institute.

Ferdinand J Pohlmeyer, chief metallurgist of National Broach & Machine Co, died at his home in Detroit Feb 20. Mr Pohlmeyer initiated National Broach's first heat treat department, and was widely known as an expert in heat treatment and manufacture of high speed steel tools.



EASY ACCESSIBILITY for tool changing or loading and unloading work is provided for in design of massively built chucker

National Acme Introduces Vertical Chucker With Four Cross-Slides, Hydraulic Control

Acme-Ryder vertical multi-spindle automatic chucking machine, based upon British design of Thos Ryder & Son, has been adapted to American standards by National Acme. Initial model is an eight-spindle unit equipped with 14-in.-capacity chucks, eight turning slides, and four cross-slides. In addition, up to four auto cross-slides, free to move horizontally as well as vertically, can be operated on the vertical turret at one time to provide greater tooling adaptability for production machining of large forged and cast workpieces. A six-spindle model equipped with 17-in.-capacity chucks, six vertical turning slides, and four cross-slides is also offered.

EIGHT-SPINDLE MACHINE (rear view) arranged for double indexing in machining both ends of cast-iron flywheel. 26 operations are performed in 43 sec total machine time

Cross-slides complement vertical end-working slides and provide flexibility and additional tooling operations not available in more conventional machines. Because the independent cross-slides are mounted on lower frame and actuated from cam drums directly beneath, they are provided with maximum support for the heaviest forming cuts as well as for cross-facing or necking operations on work surface.

Standard spindle speed range is from 32 to 628 rpm. Three spindle speeds are available at each spindle position by use of pick-off gears. Spindle carrier is positively indexed by independent motor, with hydraulically operated locking and clamping at completion of index. Changeover from single to double index is accomplished quickly by removal of cam on indexing tappet shaft.

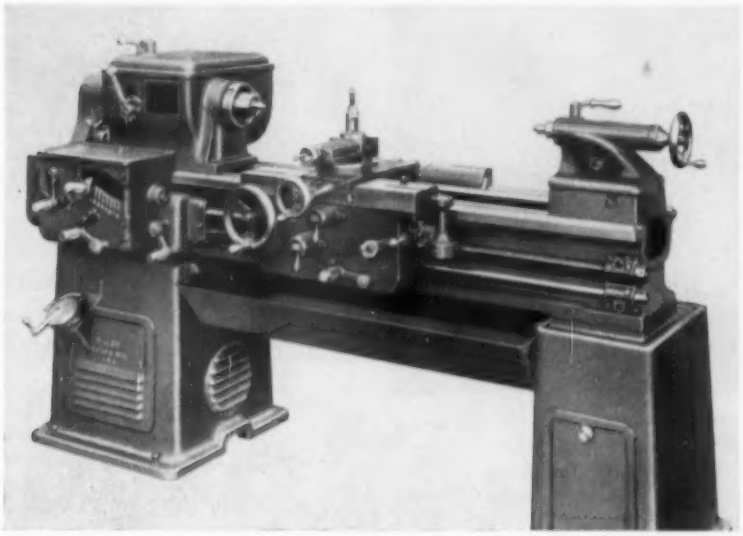
Electro-hydraulic system incorporates a number of interlocks which provide safety devices for machine and operator. Completely automatic machining cycle is controlled by a master timing cam drum which operates switches for entire electrical circuit.

Functions controlled hydraulically include opening and closing chucks; engaging and disengaging clutches in spindle drives; applying spindle brakes at loading stations; providing reverse motion of carrier to bring it back against locating catch after indexing, then actuating a wedge to hold carrier in that position; and clamping carrier during cutting.

Other specifications: 15-in. max swing; 9-in. slide travel for vertical turning; 5¼-in. cross-slide travel; 60-hp main motor; 60,000 lb net weight.

National Acme Co, 170 E 131st St, Cleveland 8, Ohio

Materials and Parts . . .



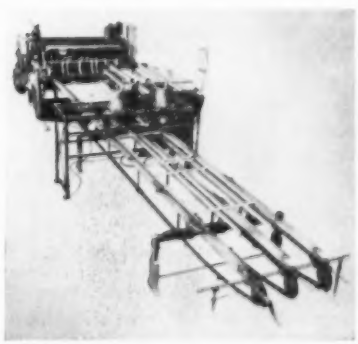
Carroll-Jamieson Lathe in 16-in. Model

Model VS-16-in. variable-speed-engine and toolroom lathe offers infinitely variable spindle speeds from 30 to 150 rpm. Spindle is belt-driven, running in extra-width Timken bearings. Triple V-link belts provide pulling power for both production and toolroom requirements.

Geared range of speeds is available for the heaviest turning operations. Gearbox provides 48 separate threads and feeds, with thread range from 3 to 184 per inch. Separate levers control longitudinal and crossfeed positive-type clutches. Large crossfeed and compound-rest dials are graduated to 250-thousandths. Both feed rod and leadscrew are provided.

Model can also be furnished to swing 18 in. Bed lengths are available to 14 ft.

Carroll-Jamieson Machine Tool Co, Batavia, Ohio



Saranac Chain-Feeding Conveyor Has Electro-Magnetic Control

Conveyor designed for precisely controlled high-production operations is said to be adaptable for feeding many types of sheet materials and assemblies into processing machines on automated production or assembly lines. Speeds of up to 100 lineal feet per min are said to be obtainable.

Electro-magnetically controlled unit features chain-feeding deck which includes two or more rails along which material is pulled by dogs attached to the chain. Materials move at constant speed, but may be instantly stopped while processing operation takes place.

Chain dogs which move materials are adjustable to change setup for different spacing or size of conveyed pieces. For volume production, automatic work stops, hopper feeds, and electronic controls may be adapted.

Saranac Machine Co, Benton Harbor, Mich

. . . including

MACHINE TOOLS AND ATTACHMENTS

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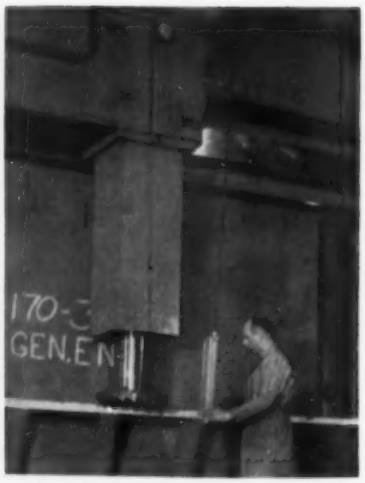
SEPARATE TABLES enable next job to be set up while machine is in operation. Here generator stator frame is being clamped to auxiliary table while low-pressure hood section for generator end of turbine is being machined



SPECIAL VERTICAL SPINDLE EXTENSION permits face-milling generator platform 72 in. below top of weldment

Ingersoll Milling Machine Handles Work Over 50 ft Long

Adjustable-rail milling machine recently completed by Ingersoll was designed to be used in the manufacture of large turbine-generator parts, and will be installed at the Schenectady, NY, plant of the General Electric Co. 250,000-lb machine stands 35 ft high and is 42 ft wide and 120 ft long over-all. Unit is capable of working on metal parts 18 ft wide, 16½ ft high, and over 50 ft long.

SIMULTANEOUS CUTS with vertical and side heads are controlled by operator from pendant station

Work will consist primarily of massive but comparatively thin-walled steel weldments in which moving parts of the turbine and generator are encased. These include big, box-like parts which are fitted together to enclose the low-pressure section of the turbine and to support the turbine rotor. Greater part of operations will consist of machining horizontal-and vertical-joint surfaces, to an over-all flatness of within 0.003 in., so that parts when assembled will form, with a minimum of hand work, steam-tight fits. Flanges and feet of these parts will also be machined, as well as feet and steam inlet and outlet pads of generator stator frames measuring up to 14 ft in diameter and 26 ft long.

Machine has horizontal cutting heads at both sides and two vertical cutting heads mounted on the adjustable crossrail above the worktable. Each head has a 100-hp dc drive motor, and the ratings of all motors used in operating the machine total 575 hp. Speed range for each head is infinitely adjustable from 8 to 317 rpm, and is made possible by three gear changes controlled electro-hydraulically from a control cabinet.

Because welded-steel assemblies generally require more rigid support than cast-iron or steel castings, machine has been reinforced considerably over conventional design practice, especially in columns and rails.

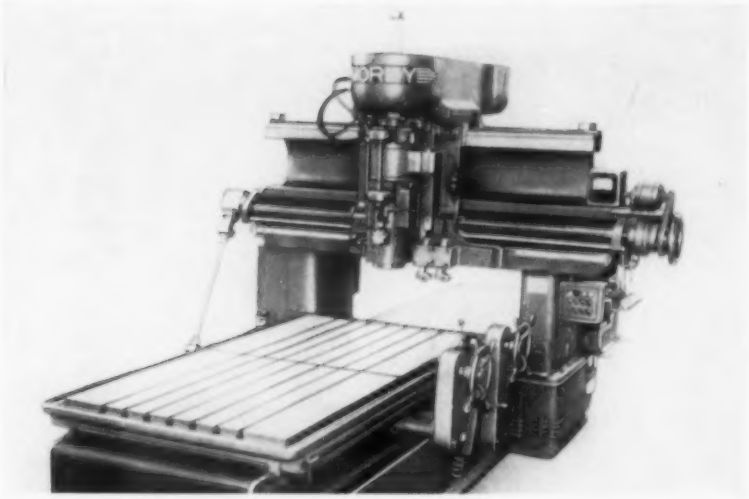
Work is carried on two 17-*ft*-wide tables, 22 and 30 ft long, which move along the 120-ft bedways. Use of separate tables, so that one job can be set up while another is in milling position, is expected to result in considerable savings by simplifying setup problems, decreasing number of crane lifts, and reducing area required for storage of parts waiting to be machined.

One operator controls all machine elements from a portable pendant, using pushbuttons, switches, and dials to start, stop, or speed up movements.

Ingersoll Milling Machine Co, Rockford, Ill

Drafting templets containing cut-out symbols of structural cross-sections and tool design elements have been added to Karp line. Tool design templet contains front and top elevations of socket, cap, countersunk and shoulder screws, as well as stripper bolts. All are engraved in actual wrench size. Structural cross-section templet has 43 cut-out symbols of I-beams, broadflanged I-beams, channels and angles from 2 to 18 in.; templet is available in 1 or ¾-in. scale. Price of each templet is $3.00.

A Lawrence Karp, 16 Putnam Park, Greenwich, Conn



Morey Profile Miller for Ferrous, Non-Ferrous Metals

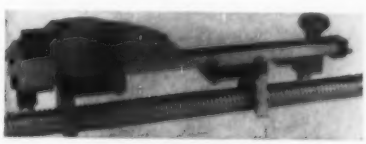
No. 50MA profile milling machine is equipped for hand profiling of ferrous and non-ferrous metals. Machine has a table size of 48 x 120 in., width between columns of 60 in., and distance between table and spindle of 21 in.

Spindle is driven by a 40-hp motor with provision for 118 speeds from 44 to 4800 rpm.

Machine illustrated is equipped with power feed to table and infinitely variable feeds from 0 to 160 ipm. Other power feeds are available with speeds up to 320 ipm.

Machine is available with tables from 48 x 48 in., in increments of 2 ft, up to 144 in. Optional equipment includes power feeds for transverse movement, vertical tracing, 360° tracing, or three-dimensional tracing systems.

Morey Machinery Co, Inc, 383 Lafayette St, New York 3, NY



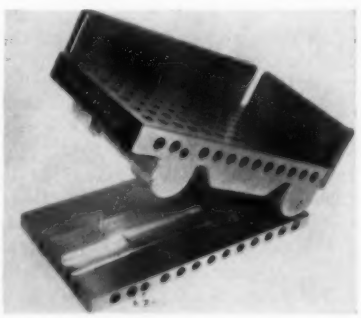
Jerpbak-Bayless Comparator Inspects Leadscrews

Portable lead-testing comparator is 12 in. long, has a measuring capacity of from ⅞ to 2½ in. thread diameter in any pitch. Once set to conform to the measurements of a master or precision screw, instrument may be used to check screws after heat treating, during the finish operation, or on the machine. Gage also checks amount of wear on leadscrews without need for removing them from the machine.

Inspection results are registered on a dial on the gage, which is self aligning. Thread wear may be determined by checking from one side of a thread. Instrument also permits rapid centralization between both angles of the thread.

Device will be shown in Booth 1031 at the Chicago ASTE show.

Jerpbak-Bayless Co, Solon Rd, Solon, Ohio



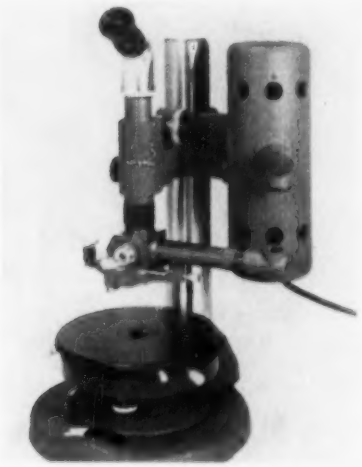
Precision Sine Plate

Whirl-Dex sine plate features precision-fitted hinge with less than 0.0001-in. clearance between fitted parts. Model has precision-spaced rolls without any holding screws. Rolls are jig-ground and fitted to hole size, one becoming the hinge pin and the other the sine roll.

Unit is reported to open square and parallel within 0.00005 in. at any point. Sufficient holes are provided on top plate for clamping work to plate while performing machine operations. There are steps of 0.1000 and 0.2000 in. for setting sines of small angles accurately.

Plate will be exhibited at the Chicago ASTE show.

Whirl-Dex Co, 14847 Heyden, Detroit 23, Mich



Multiple Interference Microscope Has Accuracy of 0.04 mu-in.

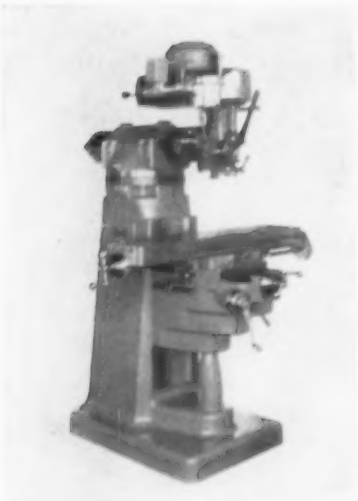
Johansson Gage Co multiple-beam interference microscope, designated Multimi 3000, is designed for nondestructive testing of metal surfaces. Device consists of stand on which interference microscope and mercury lamp are movable, together with measuring table on which test pieces are placed.

Half the wavelength of the light used, called the interference-step, constitutes the scale by which the differences in height of the metal surface are measured. Measuring accuracy is said to be as high as 0.04 mu-in., and measuring range is from 0.04 to 4 mu-in. Device can be used either for measuring in reflection or transmission, the latter being used for transparent objects. If the interference part is detached, it can also be used as an ordinary microscope.

Interference plate is fitted in a holder attached to the lower part of the microscope. Plate can be tilted in two independent axes perpendicular to each other, so that spacing and direction of interference lines can be changed. To facilitate measuring, microscope is provided with an ocular scale.

Instrument will be shown in Booth 1217 at the Chicago ASTE show.

C E Johansson Gage Co, 10641 Haggerty, Dearborn 1, Mich



Index Milling Machine Has Sliding Overarm

Index "45" mill is designed for standard milling, drilling, and boring operations. Sliding overarm incorporates a square design which is said to improve rigidity greatly.

No adjustment is required on overarm and head after use, and there is no need to re-indicate head after moving overarm. Speed range with nine changes makes possible the use of high-speed or carbide-tipped cutters to the best advantage.

Machine will be shown at the Chicago ASTE show in Booth 791.

Index Machine Co, Jackson, Mich

MICROMETER designated Taper-Mike was created by mounting a sine bar on a micrometer. Device measures taper without removing work from the machine. It will be exhibited by Jerico in Booth 240 at the ASTE show in Chicago—*J R Reinertson & Co, 4744 W Lake St, Chicago 44, Ill*

IRD Instrument Checks Rotating Machinery

Model 1064 variable filter is designed to be used in combination with IRD vibration analyzer to spot chatter in grinders, eccentricity in turning and boring operations, bearing failures in high-speed machinery, noise and vibration in ventilating systems, and to locate causes of incipient failures in all types of rotating machinery.

Direct readings can be made of displacement and phase of one or all vibration frequencies in a complete mechanism by tuning the calibrated frequency dial on the filter. Analyzer and filter combination locates angle and amount of imbalance of each rotating part.

Filter will be displayed in Booth 1026 at the ASTE show in Chicago.

International Research & Development Corp, Box 1707, Columbus 16, Ohio

Dial Indicating Gage

Johansson Mikrokator 500-502 line of precision gages is for dimensional measurements. Device is provided with a mechanical, frictionless amplification device without sliding bearings or gears. Instrument is made in three different designs and in both inch and millimeter readings.

Unit illustrated, No. 502E-4, has range of 0.004 in., is graduated in 0.00005 in., and has $\frac{3}{8}$-in. shaft diameter. Instruments will be shown at the Chicago ASTE show in Booth 1217.

C E Johansson Gage Co, 10641 Haggerty, Dearborn 1, Mich

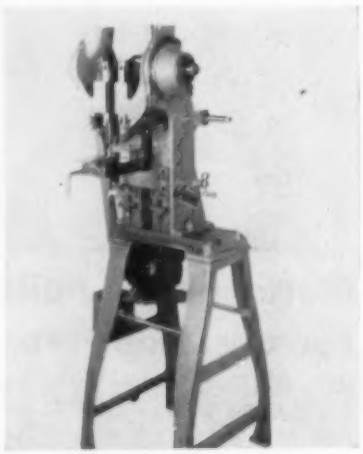
Nylon Balls

Precision balls made by Industrial Tectonics from Type FM-10001 nylon are available from stock in 14 standard sizes from $\frac{1}{8}$ to $\frac{3}{4}$-in. diameter. Other sizes can be supplied on special order.

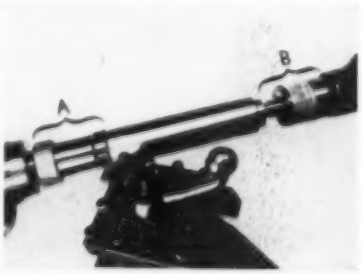
Typical applications include use in bearings, pumps, check valves, and instruments. Balls are lightweight, resist corrosion and wear, give quiet operation, and are said to be accurate to ±0.002 in. in diameter and 0.001 in. in sphericity.

Balls will be on display in Booth 1100 at the Chicago ASTE show.

Industrial Tectonics, Inc, Ann Arbor, Mich



DOUBLE RIVET SETTER, No. 555 in Chicago Rivet Co line, has special sliding fixtures with solenoid control. Machine and fixture permit setting two rivets at a time in a variety of assemblies. In production, pieces to be fastened are placed in position on the fixture. Pushing fixture forward trips a switch controlling the solenoid-operating mechanism, causing action which sets rivets. Machine will be shown in Booth 250 at the Chicago ASTE show—*Chicago Rivet & Machine Co, 9600 W Jackson Blvd, Bellwood, Ill*



COMBINATION LIVE CENTER AND DRIVING CENTER are said to eliminate use of chucks and driving dogs. Zee-Hawk driving center (A) engages teeth of specially designed driver plates in work. Motor-Tool live center (B) has overload indicator. Device will be exhibited in Booth 240 at the ASTE show in Chicago—*J R Reinertson & Co, 4744 W Lake St, Chicago 44, Ill*

NEW! Revolutionary AIRengineering Development by Ingersoll-Rand..

TORSION BAR

Torque control IMPACTOOLS

MULTIPLE TORQUE SETTINGS
2 TORSION BARS AVAILABLE:

- **No. L735. Max. torque 60 ft. lbs.**
- **No. H735. Max. torque 90 ft. lbs.**

Size 5040T*

***For torques up to 550 ft. lbs., a Size 5340T *Torque Control* Impactool is available**

...how can YOU use these ADVANTAGES ON NUT RUNNING JOBS *where prescribed torques must be met?*

- **POSITIVE TORQUE CONTROL**—a revolutionary use of a rugged steel torsion bar for precision control of torque—combined with the power and speed of the Impactool.
- **SIMPLE TORQUE SETTING**—torsion bar adjusting sleeve is clearly calibrated for changing torque with easy-to-use torque jig.
- **TORQUE SETTING REMAINS CONSTANT**—for any nut running condition until the adjustment is changed.
- **ELIMINATES "OVER-TORQUE"**—impact mechanism rebounds instantly when preset torque is reached, tripping a foolproof rubber faced shutoff valve.
- **LOW MAINTENANCE**—combines many of the proven features of Ingersoll-Rand Impactools, with their enviable record of dependable performance and low maintenance.
- **REVERSIBLE**—full power in either direction.
- **NO CLUTCH**—to wear, slip or require adjustments.

Torque can be quickly and easily set, using the jig as shown above. The torsion bar automatically shuts off the tool when the nut running resistance becomes equal to the stress in the preset torsion bar.

Ask your Ingersoll-Rand AIRengineer for a demonstration now . . . or write direct for more information on this amazing development.

Ingersoll-Rand

Impactool Division
11 Broadway, New York 4, N.Y.

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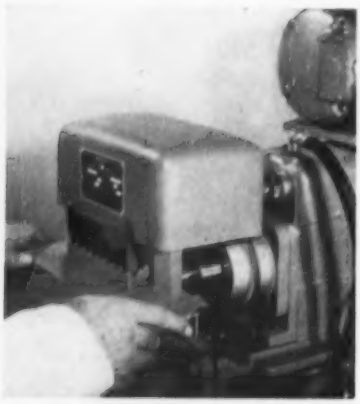


Fairchild Drilling Machine Guided by Saw-Tooth Templet

Speedy Driller is high-speed, semi-automatic drilling machine originally designed for drilling rivet pilot-holes in flanges of formed aircraft parts. Machine automatically locates and drills holes in response to saw-tooth projections on an attached templet. Holes may be drilled at speeds of up to three per second in 0.064-in. aluminum sheets, holding locations to sheet metal tolerances of ±0.01 in.

Tooling required for operation of pedestal-mounted machine consists primarily of a sheet of templet stock, cut to extend ¼ in. beyond face of material to be drilled. Overlapping edge of templet is notched so that front edge of each tooth is directly over centerline of hole to be drilled. Both templet and part are fed across machine, with flange of part fitting into an adjustable stop on front of machine.

When part and templet are fed into machine, templet's teeth engage a trigger mechanism, forcing it against a dead stop; mechanism actuates machine, which automatically drills a hole directly in front of face of the templet tooth. When drill reaches fully retracted position, trigger assembly automatically releases templet, allowing templet and part to be moved forward to next tooth for repetition of cycle.

Driller is especially recommended by maker for drilling parts having a high number of holes with relatively close spacing.

Fairchild Aircraft Div, Fairchild Engine & Airplane Corp, Hagerstown, Md

Strain Gages Can Be Used At High Temperatures

SR-4 resistance-type strain gages offered by Baldwin-Lima-Hamilton can be used at temperatures up to 1800 F. Gages are of etched-foil type.

Gages are offered for experimental use without guarantee and are available in kits which include ten gages, four types of cement with different temperature limits, detailed instructions for use, and tools to simplify application.

Gages consist of an etched foil grid 0.0005 in. thick on a temporary carrier which is stripped off when applying them, leaving the grid embedded in a ceramic cement. Nichrome, Nichrome V, and Constantan grids are available in gage lengths of 1 in., ½ in., and ⅜ in. Temperature limits of the four cements are 700, 900, 1100, and 1800 F. Tests have indicated that gages can be used in static tests up to approximately 1100 F. Above this temperature gages can be used only for dynamic tests.

Nominal resistance of gages is between 97 and 120 ohms. Kit includes 10 gages having resistances within ±0.2 ohm of each other.

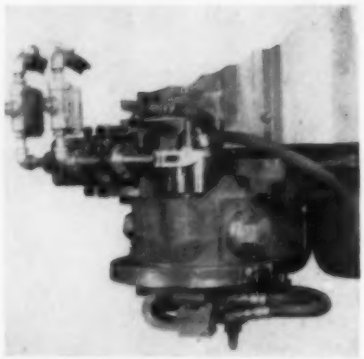
Baldwin-Lima-Hamilton Corp, Philadelphia 42, Penna

Vanco Metallizing Machine In Lightweight Model

Metallizing machine which features simplified air-governor control has dynamically balanced air turbine which provides positive power control, uniformly feeding metal wire without fluctuation, according to manufacturer. Turbine is automatically governed by the propulsion fluid supplied to the primary and secondary turbine, which are so arranged that their opposing forces are in direct proportion to the change of volume or pressure of the fluid supply.

Self-contained gas-mixing chamber is said to eliminate backfire. Lightweight construction (under 4½ lb) reduces operator fatigue.

Vandersee Corp, Route 22, Union NJ



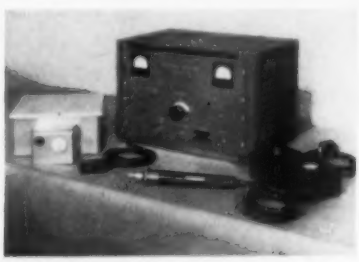
Stitch-Welding Head

Taylor-Winfield stitch-welding head may be mounted on any press welder, and replaces the upper electrode. Head, which guides spot-welding electrodes to achieve contoured seam welds, has operating speed of up to 100 spots per minute, depending on material being welded.

Either spaced or overlapping spots on any contour pattern may be used. Head, which is indexable full 360°, is water-cooled for high production.

Maximum radius of pattern is 3 in.; minimum radius of pattern is ½ in. Maximum electrode force permissible is 4000 lb. Cams are available for practically any contour.

Taylor-Winfield Corp, Warren, Ohio



Fluxless Soldering Equipment Uses Ultrasonic Head

Sonobond Model S-5-H-55-10 equipment is designed to solder or coat aluminum, copper, brass, silver, or magnesium. Equipment includes ultrasonic soldering head with 70-watt tip heater, ultrasonic generator, and 1200-watt heating platen.

Ultrasonic soldering head has ⅝-in.-dia tip, readily changeable to other standard or special tips by screw connection. Driven by a 110 R-F watt ultrasonic generator, head is air cooled.

Model will accommodate a variety of soldering tips, ranging in size from small, pointed tip to ⅝-in. diameter.

Aeroprojects Inc, 310 E Rosedale Ave, West Chester, Penna

SIDNEY

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in the plant of

THE FOSDICK MACHINE TOOL CO.
CINCINNATI
MANUFACTURERS OF
RADIAL-SENSITIVE-UPRIGHT DRILLS
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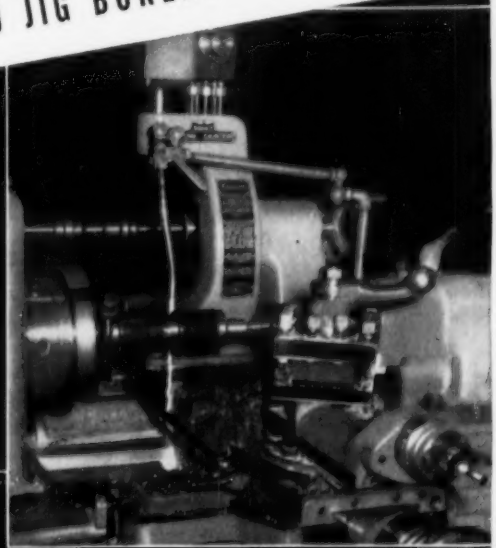
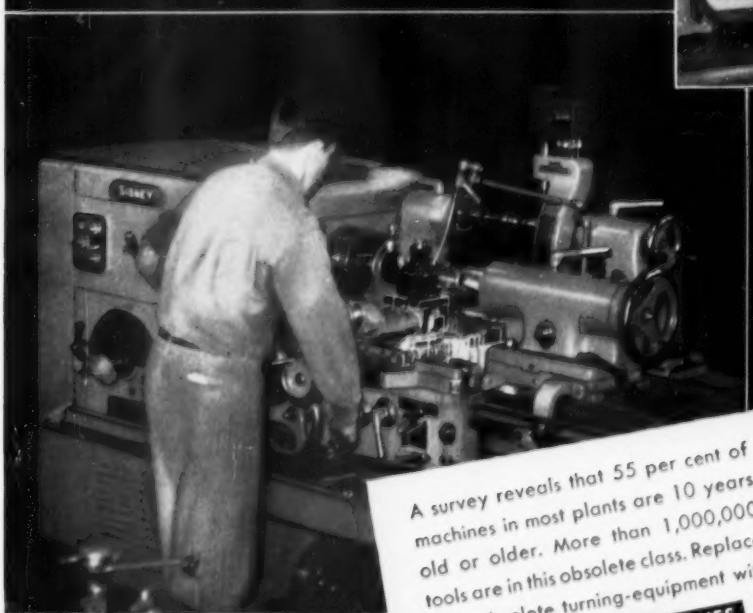


Here's what Fosdick thinks about Sidney Lathes:

"This Sidney Lathe with tracer attachment has been very satisfactory, resulting in considerably reduced production time and, at the same time, holding closer tolerances."

Note how simply and economically the SIDNEY FLUID TRACER reproduces any type of work in any quantities desired . . .



THE TRACER HEAD FOLLOWS ALONG A TEMPLATE OR MASTERPIECE AND THE WORK IS DONE WITH ACCURACY OF UTMOST FIDELITY . . . QUICKLY.

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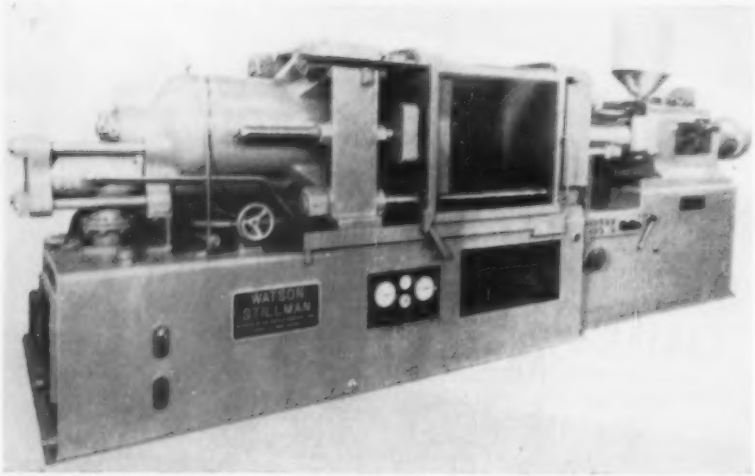

Plastics Injection Molding Machine Has Capacity of 24 oz Per Shot

Designed to give faster cycles than previous company models, horizontal plastics injection molding machine of Watson-Stillman Div of Farrel-Birmingham has a maximum shot capacity of 24 oz of Styrene. Model incorporates a straight hydraulic mold clamp with an adjustable clamping stroke.

Heating cylinder design features an internally heated torpedo with four-zone heat control for better plasticizing at lower temperatures. Injection plunger is prepositioned so that mold is filled immediately after dies are clamped. Both pressure and speed of injection stroke are adjustable in stepless variation. Stuffing arrangement is said to increase maximum shot capacity by approximately 40%.

Pumping system consists of a radial-piston pump connected to a 60-hp, 1200-rpm motor. Pump features an unloading control that reduces pump stroke and functions to maintain preset pressure continuously with automatic follow-up. Shock piston for decompression relieves shock at the prefill valve.

Machine is supplied with self-compensating hopper and feeder. Optional equipment includes weigh-feed mechanism and ram spacers. Other specifications: capacity of hopper, 300 lb; shooting injection rate, 1800 cu in. per min; stroke of injection plunger, 14½ in.; clamping capacity, 425 tons; max injection speed at 20,000 psi, 174 in. per min; floor space required, 21 in. x 6½ ft.; overall height, 8½ ft.

Watson-Stillman Press Div, Farrel-Birmingham Co, Inc, Roselle, NJ

Automatic Bar Feeder For Cutoff Machine

Automatic bar feeder designed for use with Modern Machine Tool Co cutoff machine handles random lengths of tubing and bar stock automatically, feeding stock load without attention from operator. Remnants of stock are automatically ejected and the end of new stock is automatically trimmed and chamfered.

Feeder has hopper for use with lighter wall tubing which holds 100 pieces of 2¾-in.-OD stock. Inclined table is used for bar stock or heavy tubing. Where both light wall tubing and heavy bars are used, unit may be equipped with both hopper and inclined table.

For small diameters and light wall tubing a "V" trough is used. For large stock there are rollers on which stock rotates during cutoff, and lifting rollers for stock being fed through spindle. Stock is fed through spindle by feed rolls.

Only adjustment required is for different stock diameters. Feeders are available for any length of bars, and in sizes to fit every model of company's cutoff machine.

Modern Machine Tool Co, 2005 Losey Ave, Jackson, Mich

Torit Dust Collector Has Increased Horsepower

Horsepower has been increased from ½ to ¾ on Model 64 for use with grinders and lathe operations that create noxious dust.

Steel cabinet unit provides 60 sq ft of filtering area. When used with one 4-in. inlet, it moves 500 cfm of air at 5700-fpm air speed and a static pressure of 4 in. (water). Model is available with internally mounted motors of 60 c, 110/220 v, single-phase, or 220/440 v, 3-phase. Dimensions are 33 in. high, 22 in. wide, 24 in. deep.

Torit Manufacturing Co, Dept KP, 287 Walnut St, St Paul 2, Minn

Vacuum-Sintered Carbides

Series 8-A and 6-A carbide grades are designed for machining tough steels, alloy steels, and high-tensile-strength steels. Vacuum-sintered carbides, 8-A for roughing cuts and 6-A for finishing cuts, are reported to permit 30% higher feed and speed rates in steel-cutting operations than other grades in company's line.

Grades are available from stock in all standard blank sizes. Advantages of grades, according to manufacturer: greater edge strength, exceptional wear qualities, and greater resistance to cratering.

Willey's Carbide Tool Co, 1340 W Vernor Hwy, Detroit 1, Mich

HELI-COIL PIP PUSH INSERT is inserted into straight-sided, plain hole to provide female threads in non-structural parts at reported cost of less than 1¢ per hole. Production rates are said to be up to 1200 per hr, using a mandrel to insert the part into the hole, with the aid of a machine with a suitable stroke such as a drill press, kick press, arbor press or air piston. Rotation is not required for insertion. Designed for insertion into plastics, zinc die castings, aluminum alloys, lead-base alloys, soft copper base alloys, and certain ferrous metals. Inserts are available in copper-clad steel, phosphor bronze, cadmium plated steel, or other wire materials—*Heil-Coil Corp, Danbury, Conn

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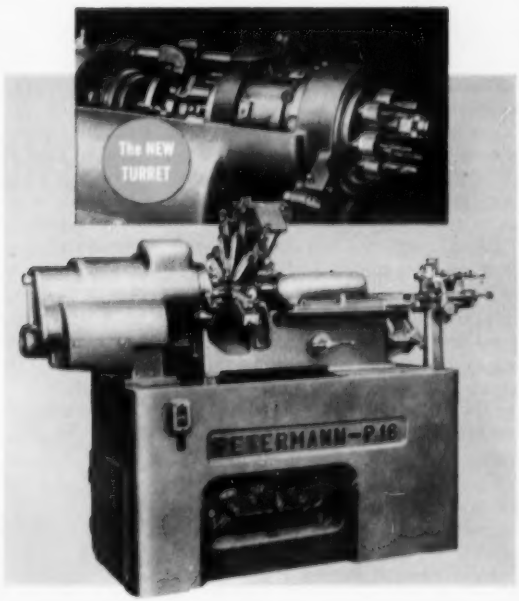
9 Sizes and Styles



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Automatic Lathes • Gear and Pinion Cutters
6 Machines

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Single Spindle Automatic Lathes
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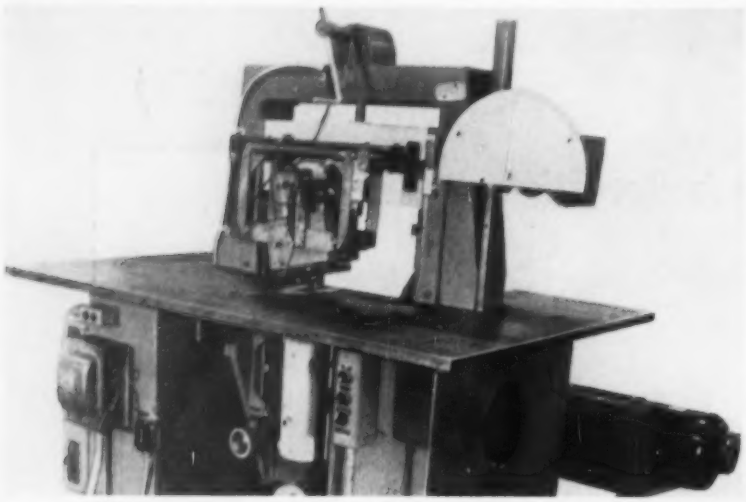
RUSSELL, HOLBROOK & HENDERSON, INC.

292 Madison Avenue, New York 17, N. Y.



Ekstrom-Carlson Router Employs Photo-Electric Scanner

Automatic router now in use at Fort Worth, Texas, plant of Convair Div of General Dynamics employs a photo-electric scanner to machine variable angles continuously. Machine was designed for cutting angles on stretch form blocks, hydropress tooling, and machining of production parts from slug material.

Initial setup for job is preparation of a templet which is later secured to top of material to be cut. Templet is either black and white, and tilt lines are scribed on it in a contrasting color. Color of tilt lines excites photo-electric scanner on the router. Angle of cut is determined by distance from edge of templet to tilt line.

Operating specifications: total angular travel of routing mechanism (6 settings) is ±45°; angular travel in each setting is 15°; distance scanner moves each degree of tilt is 0.060 in.; vertical cutter adjustment is 2½ in.; and vertical travel of cutting and tracing unit is 3 in.

Accuracy of machined cuts is said to be within ±15 min of arc. 5-hp, 3600 rpm ac motor has a spindle speed of 10,000 rpm.

Ekstrom, Carlson and Co, 1400 Roadrail Ave, Rockford, Ill

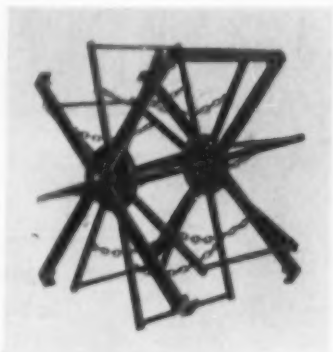
Punches, Stamps, Blanking Dies Assembled in One Dieset

Series of punches, stamps, and blanking dies is assembled in one dieset for production of tags and checks.

Sleeve-design dieset fits into any standard 10-ton or larger punch press. Assembled units are mounted on one bedplate; material is fed through from a roll or strips to left of punch press. As each check or disk is completed it drops off a chute into tote pans or conveyor. Production can be several hundred tags per minute.

Assembly can be adjusted for a stroke ranging from ½ to 2 or 3 in. Closed height of dieset can be 7½ in. or larger, and shank can be 1 in. and upwards. Over-all length of entire assembly is approximately 15¾ x 8½-in. depth x 9-in. over-all height.

Acromark Co, 7-13 Morrell St, Elizabeth, NJ

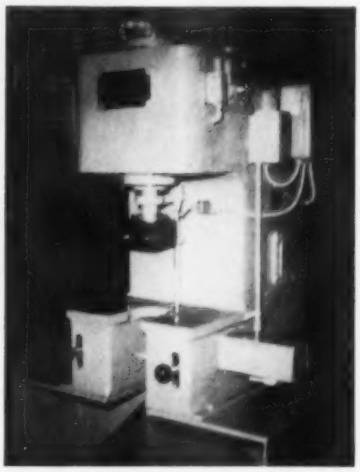


Lorco Universal Rack For Barrel Tumbling

Built for assembly within compartment of horizontal barrels, tumbling fixture can be ordered to fit most barrels. Outside framework of heavy-gage machined steel is adjustable to insure tight fit inside the barrel. Inner portion is a revolving "ferris wheel" with several work stations. Each station will accommodate one large part or several smaller parts. Rods or chains to hold parts are provided with rubber hose to prevent damage to work.

Rack is shipped knocked down with all parts marked for quick assembly. Purchaser should specify shape of barrel, inside length of compartment, inside distance from flat to flat and corner to corner, and inside dimensions of door opening.

Lord Chemical Corp. 2068 S Queen St, York, Penna



Acme Hydraulic Bench Press For Die-Forming Operations

Model BB6-A hydraulic bench press is used in conjunction with dieset furnished by plant to produce approximately 480 parts per hour at 80% efficiency.

In operation pre-heated work is placed in lower (stationary) die cavity and both operating levers are pushed downward by the operator. Ram carrying upper die half descends; when die is closed, contact is made with a limit switch which activates a solenoid-operated locking plunger, holding control levers in down position and maintaining pressure on dies. Upon contact with limit switch, an electronic timer is also activated, so that operator can release controls and the timer device can take over. When dies have been closed for a predetermined time, locking pin is automatically withdrawn and spring pressure trips the control mechanism, so that ram raises the upper die and stops at top of stroke.

Acme Press Div, Acme Broach Corp, Milan, Mich

Sperry

ultrasonic inspection news

40-FOOT ALUMINUM EXTRUSIONS INSPECTED UNDER WATER

How to inspect 40-foot, 1850-lb. aluminum extrusions for internal defects, prior to machining into helicopter blades? — Piasecki Helicopter Corp., Morton, Pa., required an immediate answer to this problem.

The solution was provided by Sperry Products' Commercial Testing Service. At Sperry's Danbury laboratory personnel and equipment were available, including a 100-foot tank which would permit ultrasonic immersion inspection of the huge extrusions.

To best meet your individual inspection requirements, Sperry Products Commercial Testing Service offers you complete ultrasonic testing laboratories in Danbury, Pittsburg and Chicago. Convenient in-your-plant inspection service is also available from these offices, as well as from Sperry Sales Offices in Boston, New York, Philadelphia, Atlanta, Houston and Los Angeles. Sperry Western, Inc., Lafayette, La., offers its specialized experience to the Oil Field Industry.

Actual inspection was accomplished with a Sperry UW Reflectoscope and a PH Positioner equipped to hold the search head at a constant distance from the section. These instruments were mounted on an electric car which also carried the operator. Straddling the immersion tank, the unit was capable of testing at speeds ranging from 2 feet to 32 feet per minute. To perform a complete inspection, covering the 31 inch width, including fillets, required a total of 117 longitudinal passes over each extrusion.

sperry products INC.

FIRST IN ULTRASONIC INSPECTION

To keep posted on latest developments in the profitable use of ultrasonic inspection by industry send for your copy of our new Ultrasonic Inspection News Letter.

Sperry Products, Inc.
203 Shelter Rock Road
Danbury, Connecticut

- ☐ Send me Commercial Testing Service information.
- ☐ Send me the Ultrasonic News Letter.
- ☐ Send me Reflectoscope information.

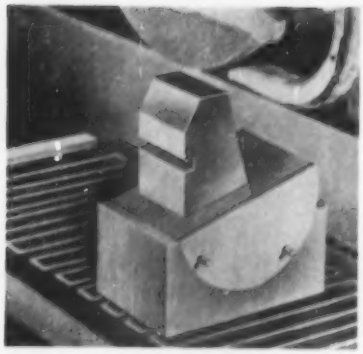
Name _____

Title _____

Company _____

Address _____

City _____ *Zone* ___ *State* _____



Adjustable Magnetic Workholder Added to Anton Accessories Line

Designed for use on any machine equipped with magnetic chuck, unit is constructed of alternating laminations of brass and iron having high permeability and low residual magnetism.

Holding block has a flat ground face, upon which work is secured, and which is rotated by hand to required angle. Angle is set with the aid of a protractor and planer gage. Position setting is recorded from planer gage reading for future reference. Height setting may be varied in small angle increments to assure necessary accuracy for precision machining.

Anton Machine Works, 1226 Flushing Ave, Brooklyn 37, NY

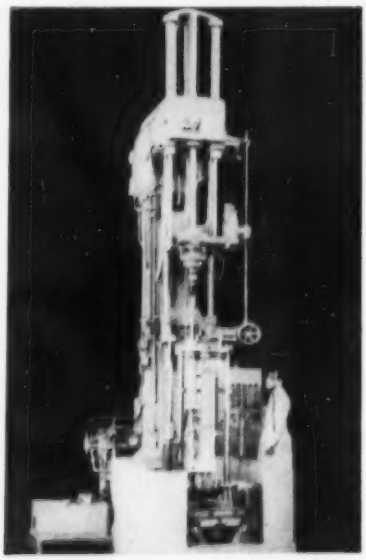
Ultrasonic Measuring Device Detects Flaws in Metals

Inspectogage 56 is designation for ultrasonic measuring device which provides non-destructive testing of metals, glass, and non-filled plastics. Device gives visual indications of material thickness and requires access to only one side of the measured work. Any flaw due to discontinuity or lack of bonding is indicated by a shift or disappearance of the thickness reading.

Unit consists of an oscillator, cathode-ray oscilloscope, and transducer which transmits ultrasonic vibrations into the tested material. When the frequency oscillator is the same as the resonance frequency of the material, a vertical marker appears on the face of the tube, indicating exact thickness of material by pointing to a calibrated screen.

Entire unit weighs 50 lb, is portable, and is provided with a metal case. Power requirements are 115v, 60 cycles. On standard unit, search units scan four ranges from 0.025 to 0.3 in. Calibrated screens are provided for the four ranges. Other ranges are available if required.

Alcar Instruments, Inc, 17 Industrial Ave, Little Ferry, NJ



Heavy-Duty Microhoning Machine Has Fifty-inch Stroke

Micromatic Hone's Model 450 Hydrohoner has a maximum 50-in. hydraulic head stroke and a work-diameter capacity of 15 in. Machine may be obtained with either remote-control manual mechanical feed or automatic hydraulic tool expansion.

Machine is equipped with eight-speed transmission, variable-delivery hydraulic pump and tank unit and controls, and safety interlock to hold head in the up position.

Unit can handle both ID and OD honing of work. For ease of loading and inspecting, internal honing fixture has a tilt-down feature.

Micromatic Hone Corp, 8100 Schoolcraft Ave, Detroit 38, Mich

New RFC Induction Heater Line Incorporates Special Features

Model 5000 Special is particularly recommended for high temperature (1900 F) brazing or for very rapid brazing, soldering or hardening of parts without affecting nearby sections.

Features include boxed, shielded control panel mounted over the high frequency section for easy meter reading and timer setting; dry-type, automatically tuned RF output transformer for use with coils of one or more turns; air-cooled tube; mica silicone transformers; radiation-proofed, extra heavy steel cabinet; all aluminum parts anodized and corrosion-proof; heavy, pure silver plate on all high frequency sections; oscillator capacitor of heavy 2S aluminum welded throughout.

Radio Frequency Co, Medfield, Mass

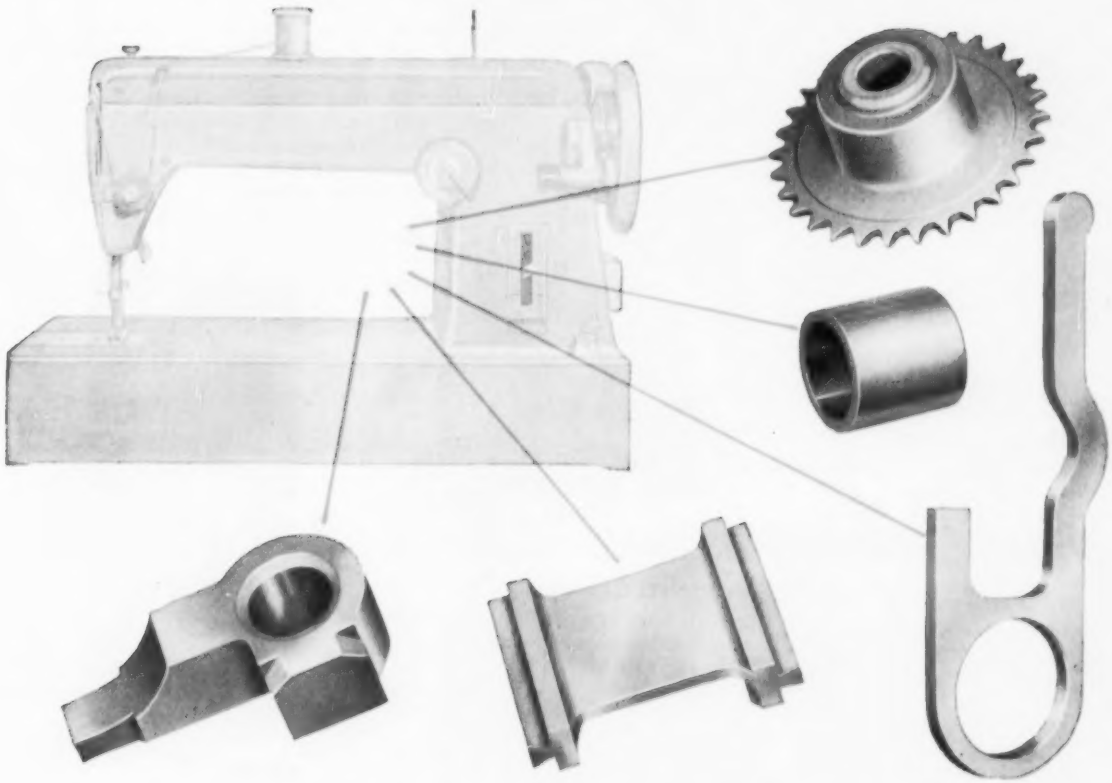
Indexable Insert Holders For Offset Machining

Furnished in RH or LH offset styles, either Model GAR or GAL can perform facing or turning or a combination of both in one operation. Four sizes are available.

By angling the holder in the tool block 5°, tool can be used for square shoulder turning or facing without resetting. Listed as a semi-standard, it incorporates the same band-locking principle of holding the insert as the standard line of Wesson Multicuts. Standard D-80 solid diamond shaped carbide inserts with an 80° included angle are used.

Wesson Co, 1220 Woodward Heights Blvd, Detroit 20, Mich

IN POWDER METALLURGY . . . IT'S AMPLEX



Switching to OILITE® helps Make this Manufacturer Competitive

Price competition and rising production costs caused one sewing machine manufacturer to re-examine his component parts to determine how costs could be lowered while maintaining high quality standards.

Super OILITE and Steel OILITE provided the answer. Many parts, including gears, eccentrics and sprockets, were redesigned for production in these high-strength materials. Formed in automatic presses in seconds, these OILITE parts reduced costs substantially by eliminating costly machining operations . . . and high quality is maintained.

The conversion provided another benefit. Certain parts were designed to take advantage of the self-lubricating qualities available in some OILITE materials.

Let Amplex help you with your parts problems. The Chrysler-Amplex engineering facilities, unmatched in the powder metal industry, are ready to serve you. Call or write today.

CHRYSLER AMPLEX PRODUCTS

OILITE Bearings
Permanent Metal Filters
Finished Machine Parts
Friction Units

IT'S NEW! IT'S FREE!

First complete information on powder metal bearings, finished machine parts, filters and special parts. 48 pgs. Write today for OILITE Engineering Manual E-55.

OILITE — *Only Chrysler makes OILITE*

CHRYSLER CORPORATION • AMPLEX DIVISION

Dept. 5-3, Detroit 31, Michigan • Overseas Distribution—Chrysler Export

Automatic Lubricator For Monoflo Conveyor

Unit consists of 1-oz transparent oil reservoir with adjusting knob to control rate of oil flow, snap-action flow valve, and sight glass to check rate of flow. Counterweighted frame positions feed nozzle directly over cable.

Lubricator travels to end of conveyor, dispensing a measured amount of oil along entire length. Operation can be performed while Monoflo is conveying full load of parts.

M-H Standard Co, 515 Communipaw Ave, Jersey City 4, NJ

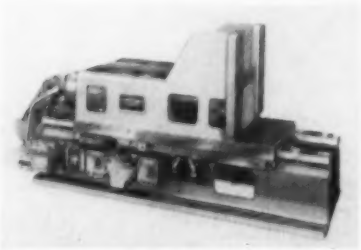
1000-lb Hydraulic Lift For Limited-Space Operations

Crown E-Z Lift Model LT-1000, a manually operated unit, is designed to solve lifting problems where operating conditions or limited space make larger power lifts impractical.

Loads can be elevated to any height between 5¼ in. and 54 in. above the floor. Unit has roller-bearing-equipped rubber front wheels and swivel rear casters; positive-action brake is foot-operated. Lift is equipped with safety overload release set to refuse loads of more than 1200 lb.

Tubular steel model is 64 in. high, 24½ in. wide and 35 in. long, weighs 270 lb; safety plate platform is 24 x 24 in.; straddle capacity is 16½ in. Price, $239.95, fob.

Crown Controls Co, 40-44 S Washington, New Bremen, Ohio



Hydraulic Feed Unit

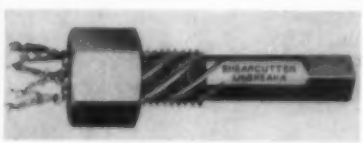
Model 405 way-type hydraulic feed unit features thrust above the ways near the tool load. Power cylinder, located above ways, is more accessible for maintenance than in other positions; hydraulic control panel can be mounted on either side of unit.

Thrust of unit depends on hydraulic pressure: at 1000 psi, the 4-in. hydraulic cylinder provides 12,000 lb of thrust.

Feed rate is infinitely variable from 0 to 24 ipm. Rapid advance is 8 ips, and rapid return is 5 ips. Rapid-advance and feed-stroke lengths are adjustable. Multiple-spindle drive motors up to 1800 rpm at 20 hp can be mounted on saddle.

Unit can be mounted in horizontal, angular, or vertical position.

Hartford Special Machinery Co, Hartford 12, Conn



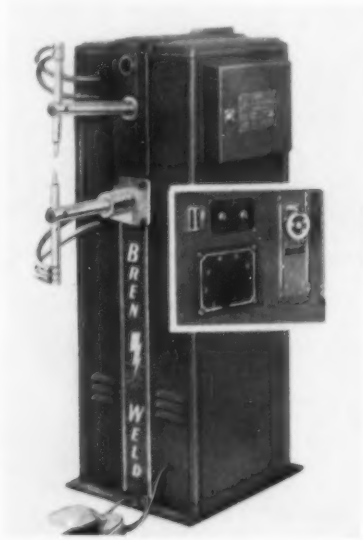
Shearcut Taps Have Spiral Flute Design

Unbreaka thread broaches operate in a shearcutting manner, forcing the chip ahead of the tool and reportedly eliminating tap breakage through chip interference. Taps are designed to operate at drilling speeds or faster.

Left-hand flutes feed coolant or cutting oil downward, dissipating heat and washing out small particles of metal.

According to manufacturer, only about one-half normal torque is required to form thread. Taps are interchangeable with standard taps and can be used for any manual or mechanized operation.

Shearcut Tool Co, 7045 Darby Ave, Reseda, Calif



Air-Operated Spot Welder Has Power Factor of 70%

Fully automatic Bren/Weld SP-100 welds 18-gage steel 100 spots a minute, lighter gages as fast as operator can feed it, according to manufacturer. It is said to be the first unit of its type to incorporate the transoidal transformer.

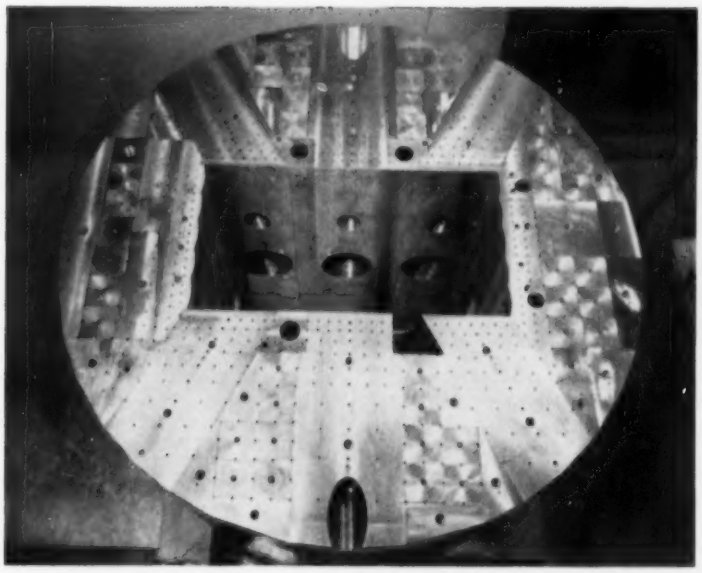
Additional features: repeat, non-beat operation; NEMA-type 1AX timer; welded structural steel frame enclosed in heavy-gage steel case; heavy-duty, double-acting air cylinder with adjustable speed control in both directions; welding horns which can be moved in and out, and rotated 360° for maximum versatility; controls mounted on a single, side panel; self-compensating pressure switch which eliminates need for adjustments when air pressure is changed.

Brennen, Bucci & Weber, 262 Mott St, New York 12, NY

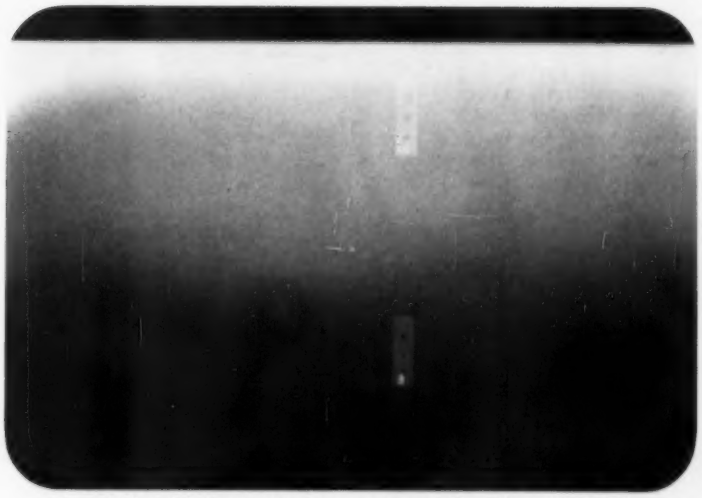
Teflon hose assembly, designated 666, reportedly withstands temps from −100 to +500 F; is acid-resistant; has detachable, leakproof, reusable fitting, assembled with vise and wrench.

Aeroquip Corp, Jackson, Mich

ATOM TAMER...



PROVED READY FOR ITS JOB



BY RADIOGRAPHY

Core of Materials Testing Reactor, made up of beryllium blocks, all radiographed for soundness.

BERYLLIUM makes an excellent moderator and reflector in a nuclear reactor. But to do its job and minimize neutron consumption by absorption, it must be especially pure and free of pockets or other faults.

Hence, the Brush Beryllium Company radiographed each block used for the core of this reactor after the beryllium powder had been compressed to form the ingot. These radiographs provided proof that no voids existed in the block, no foreign materials had slipped into the pure powder.

Proving soundness of powdered metals in this way parallels the use of radiography in the castings field. It's the sure way to know that no significant voids, gas holes or porosities exist.

If you'd like details on how radiography can work for you, get in touch with your x-ray dealer, or write us for a free copy of "Radiography as a Foundry Tool."

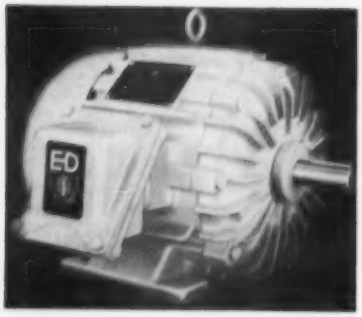
Radiography...

another important example of Photography at Work

EASTMAN KODAK COMPANY

X-Ray Division Rochester 4, N. Y.

Kodak
TRADE MARK

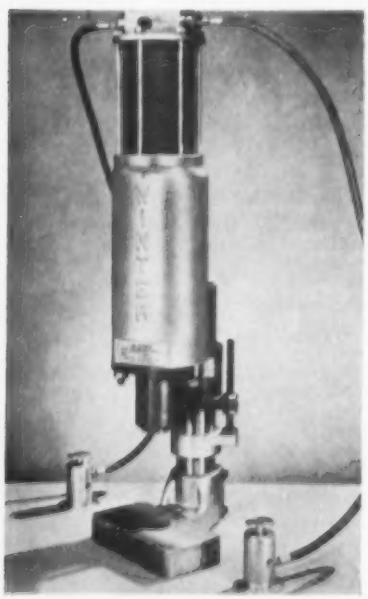


Explosion-Proof Motor

Type H explosion-proof motor, built to rerated NEMA standards, is manufactured in ratings of 1 to 30 hp. Motors are made for Class I, Group D service for areas where inflammable gases and volatile liquids are present, and for Class II, Groups F and G service in areas where combustible dusts are present.

Motor is fully enclosed and nonventilated in frames 182 and 184. Frames 213 through 326U are fully enclosed and equipped with sparkproof aluminum fan, cast-iron conduit box, one-piece cast-iron frame, and end bracket with eight bolts.

Electro Dynamic, Div of General Dynamics Corp, Bayonne, N J



Controlled-Power Safety Press Has Design Improvements

Model RR-7-A, a bench-mounted unit for light staking, forming, and other secondary-press work, delivers an accurately controlled impact from 0 to 12,000 lb, or a squeeze up to 12 times airline pressure.

Cast aluminum base has a 2-in.-dia relief hole. Combination elevating mechanism and key raises and lowers press head, and maintains angular position of head on column. New, positive method of keying ram in ram housing is provided. New control system consists of a double pilot 4-way valve mounted on the air cylinder head. Valve operates the press on the downstroke and an air blow-off system on the up stroke; it is controlled by two hand-operated, 3-way valves, one normally on, the other normally off. Holding down either of the two hand valves makes press inoperative until released.

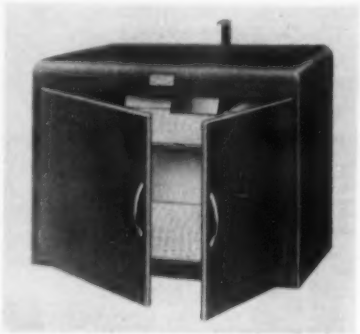
Winter Products, Inc, Box 3112 Barnum Station, Bridgeport, Conn

Pacific Height Gage Cuts Cost By Eliminating Extra Equipment

Height Master is an independent, self-contained instrument which eliminates need for gage blocks or transfer-measuring equipment. It can be set from inches to hundredths to thousandths in a few seconds. By unloosening a torque screw, setting to the desired inch is acquired; when screw is tightened, it is locked precisely. By turning thimble, desired hundredth is registered on vertical scale, and thousandth lines up on horizontal scale.

Two models are currently available —both have range of measurement graduations from 2 to 17 in. Model 1710 reads directly to 0.001, and is recommended for layout work and general inspection; Model 1705, for checking fixtures, drill jigs, and for precision layout and inspection without reference gages, reads directly to 0.0005. The 14-lb instrument has a 5¾ x 3¾-in. base; lapped, carbide inserts. Accessories include indicator extension arm; hardened tool steel scriber; dial indicator with reading of ±0.005.

Pacific Gage Co, 6501 Avalon Blvd, Los Angeles 3, Calif



Grieve-Hendry Electric Oven In Portable Model

Model CR-1 portable electric oven is designed for variety of industrial uses, including preheating molds, baking enamels, dehydrating bobbins and coil forms, and all types of processing.

Fresh air is drawn into oven and stale air driven out through specially located vents by a fan driven by a motor mounted outside the unit. Adjustable damper gives wide range of constant temperature.

Oven is constructed so that one unit will nest on top of another. Units can be used in groups or singly. Construction is heavy-gage steel with asbestos air-cell insulation.

Inside dimensions are 28½ in. wide, 24 in. deep, and 20½ in. high. Removable shelf permits use of entire height. Drip pan and removable shelf are standard equipment.

Model illustrated is capable of heating to 225F in 15 minutes, and is priced at $98.50. Other models for higher temperatures or with extra shelves are available.

Grieve-Hendry Co, Inc, 1401 W Carroll Ave, Chicago 7, Ill

Nylon stop nut, Brilok, is a one-piece, washer-faced, resilient hexagon which is simultaneously self-tapping, locking, and insulating. Reusable fastener is said to have strong resistance to corrosion, vibration, impact, galling, conduction. Currently available in sizes number 4, 6, 8, 10, and ¼ in.

American Screw Co, Willimantic, Conn

REVERE

Extruded Shapes give HUBER 5 GREAT ADVANTAGES

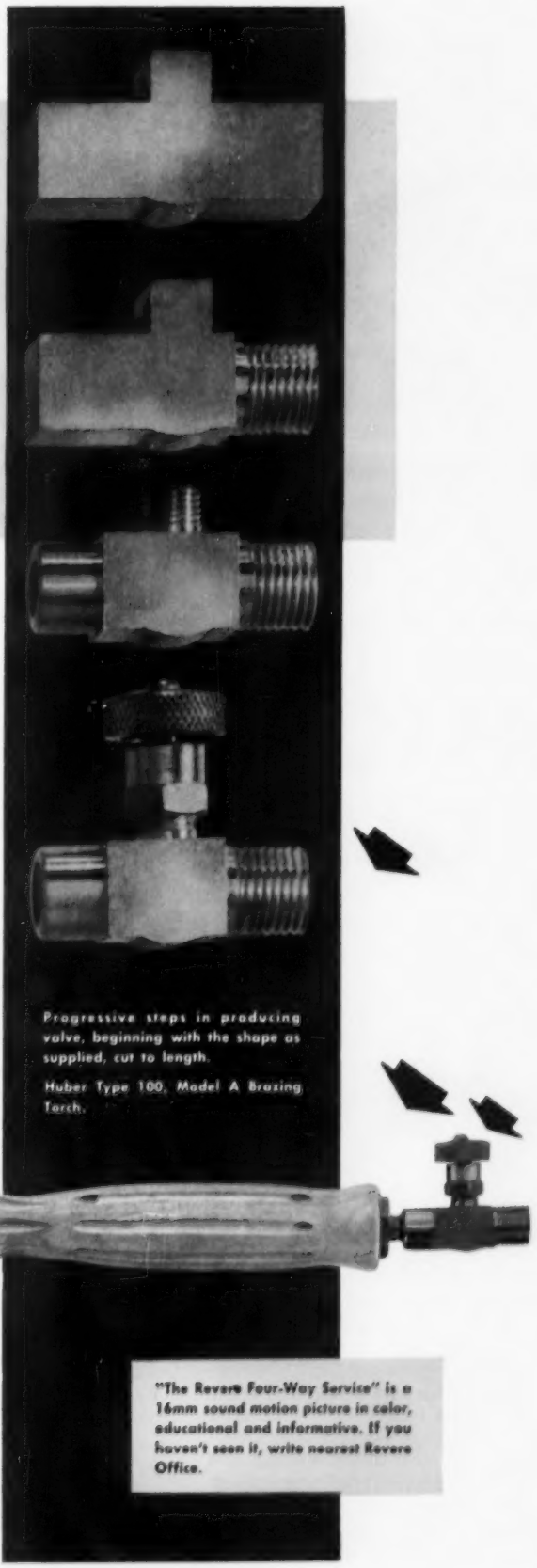
—they can do as much for you

This is the story of a Brazing Torch valve body, made by Huber Industries, Cincinnati 38, Ohio, chiefly out of a brass extruded shape furnished by Revere. As a result of experience Huber has become an outspoken advocate of shapes. Here are the five advantages Huber has found:

1. Machining time reduced 50%.
2. Uniform dimensions mean only one machine set-up for each operation.
3. No rejects whatever. Testing completely eliminated.
4. Uniformity of metal means minimum wear on tools.
5. Buy slugs cut to length, eliminating cutting-off.

The only part of this valve not of brass is the stainless steel conical valve stem.

An extruded shape costs more per pound than standard rod or bar, but the reductions in machining, finishing and other costs much more than make up the difference, and you save money. If you are machining copper and copper-base alloys, or aluminum alloys, get in touch with Revere and learn the advantages of extruded shapes.



Progressive steps in producing valve, beginning with the shape as supplied, cut to length.

Huber Type 100, Model A Brazing Torch.

REVERE

COPPER AND BRASS INCORPORATED

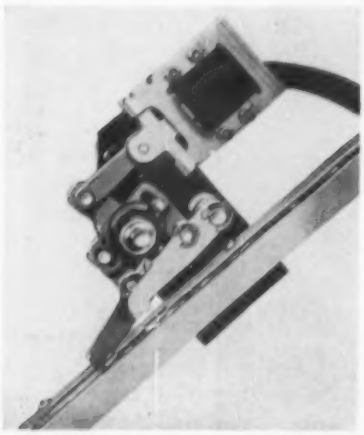
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

* * *

Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.

"The Revere Four-Way Service" is a 16mm sound motion picture in color, educational and informative. If you haven't seen it, write nearest Revere Office.



Dixon Parts Escapement For Automatic Parts Feeding

Parts escapement is designed to be attached at any point along feed track. Spring-loaded fingers automatically release the individual parts. Escapement will not jam or damage work, according to manufacturer; no special slots or track junctions are required.

Device will automatically release up to 200 parts per minute, one at a time. Escapement fingers can be shaped or formed to accommodate any piece-part up to 3 in. diameter.

Escapements are available for solenoid or air-cylinder operation. If a convenient vertical movement is available, mechanical linkage may be used.

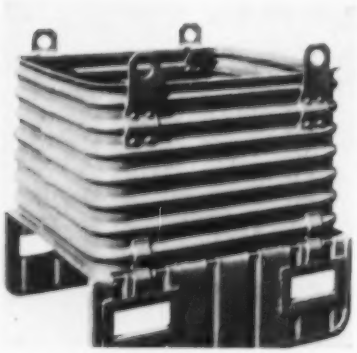
Dixon Automatic Tool, Inc, Rockford, Ill

Non-Electrical Locking Device For Rivet Coolers

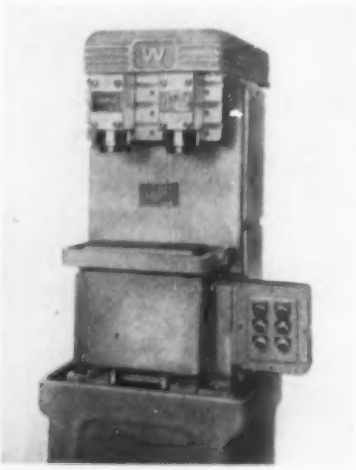
Locking device used in connection with temperature control of aluminum rivets locks refrigerator when temperature within cold chamber rises above preset level. Aluminum rivets must be stored at –30F after annealing to preserve softened condition and to prevent splitting and breaking when pressure is applied. Device locks freezer lid to prevent use of rivets if temperature rises above set level. Key retained by supervisory personnel must be inserted in lock to open lid.

Device has other applications where temperature variations must be kept within a given range. Unit can be preset to operate at any temperature from 20F to –50F. Other models are available to cover higher or lower temperatures.

Webber Engineering Corp, Box 217, Indianapolis 5, Ind



CORRUGATED ALL-STEEL SKID BOXES have lapped round corners, replacing butt straps and butt welds. Units have four-way entrances, and are built to customer specifications. — *Palmer-Shile Co, 16019 Fullerton, Detroit 27, Mich.*



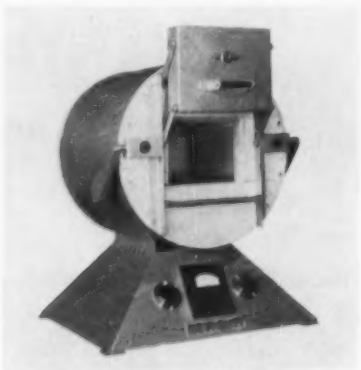
Wadell Boring Machine Has Four-Inch Stroke

Designed primarily for precision boring, counterboring, facing and chamfering, Wadell automatic vertical boring machine is reportedly capable of maintaining tolerances as close as 0.0001 in., and surface finishes of 10 mu-in. rms. Machine occupies only 4 sq ft of floor space.

Featuring an intermittent or continuous automatic cycle, machine can be automated either as a single unit or in multiple units. Standard cycle time is 5 to 80 sec; machine may be equipped with faster or slower cycle if desired.

Maximum stroke is 4 in., and maximum spindle speed is 8000 rpm. Unit is available with or without tooling.

Wadell Equipment Co, 119 South Ave, Garwood, N J



Hevi Duty Muffle Furnace Operates to 1850 F

Muffle furnace, Type 012148-PT, is self-contained unit consisting of a furnace and base containing all controls and instruments necessary for operation. Round design provides additional insulation at sides, top, and bottom compared to square design of more conventional type.

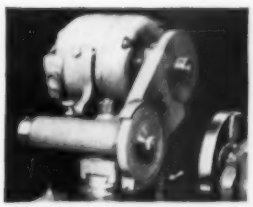
Furnace is said to heat to 1850F in 70 minutes with only 1800 watts loss at max temperature. Heating chamber has inside dimensions of 11 x 14 x 8 in., and is formed by four heating units which can be arranged to expose the element or reversed to form a muffled chamber. Counter - balanced hinged door swings to an upward position, keeping the hot side away from the operator.

Controls include pyrometer and two control switches connected to a transformer which offers 48 steps of power input.

Hevi Duty Electric Co, Milwaukee 1, Wis

Tap extension is available in a complete set in case containing nine different sizes. Designed for use on production tapping machines as well as for hand operations, extensions will hold all standard sizes from No. 0 through ½ in.

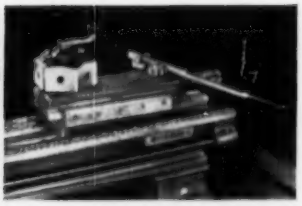
Ritmar Corp, 183 New York Ave, Huntington, LI, NY



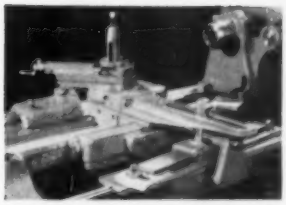
External Grinder

Milling Attachment

Handlever Tailstock



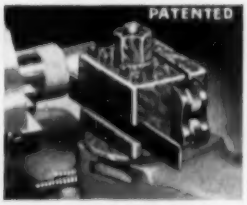
Handlever Bed Turret



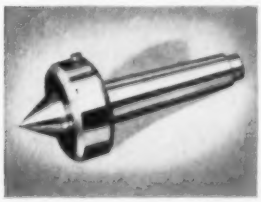
Telescopic Taper Attachment

Handwheel Collet Attachment

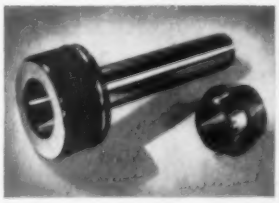
Handlever Collet Attachment



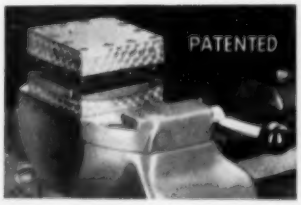
10 in 1 Tool Holder



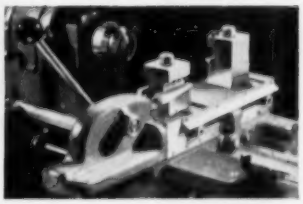
Ball Bearing Live Center



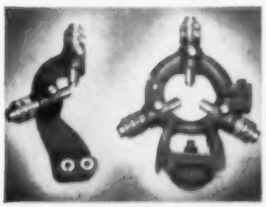
Adjustable Collet Bushing Chuck



Square Turret Tool Block

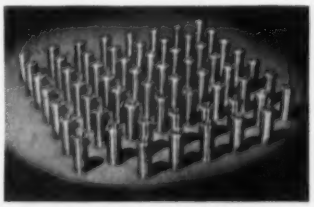


Handlever Double Tool Cross Slide

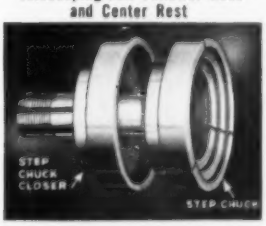


Telescoping Jaw Follower Rest and Center Rest

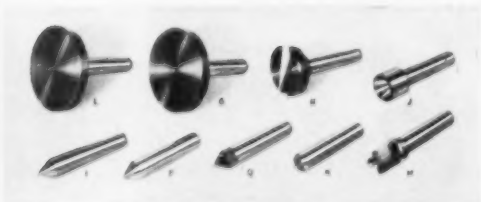
Collet Rack



Steel and Brass Collets

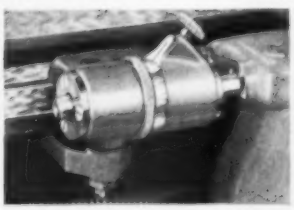


Step Chucks and Closers

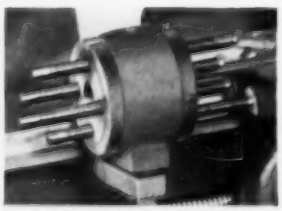


Centers and Drill Pads

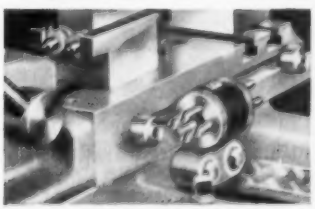
Thread Indicator



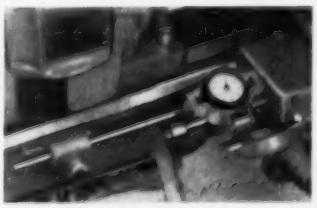
Micrometer Carriage Stop



Four Position Carriage Stop

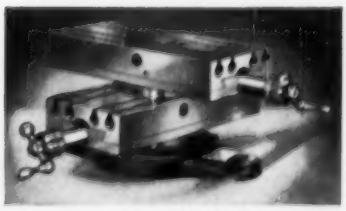


Four Position Cross Slide Stop



Dial Indicator Carriage Stop

Coolant Pump



Universal Table

SOUTH BEND

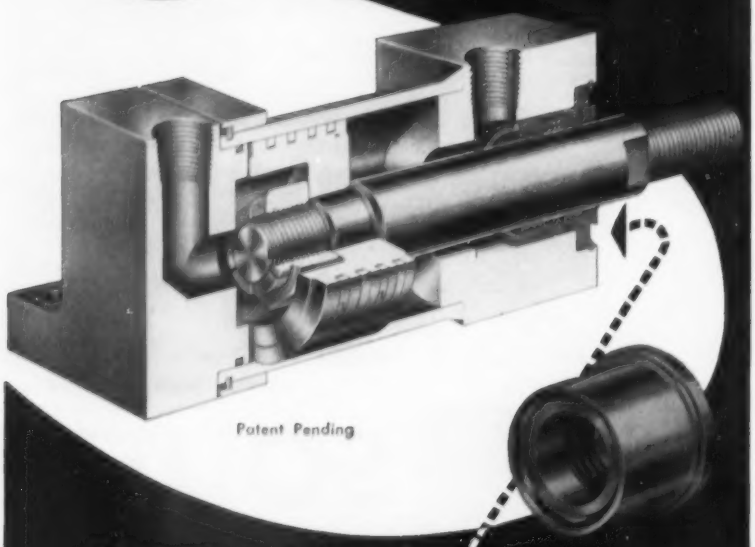
LATHE ATTACHMENTS

— Cut Production Time
— Simplify Difficult Jobs
— Increase Lathe Versatility
— Speed Up Tooling
— Perform Special Classes of Work
— Reduce Operator Fatigue

WRITE FOR CATALOG 5600

SOUTH BEND LATHE
SOUTH BEND 22,
INDIANA

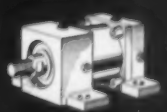
High Pressure HYDRAULIC CYLINDERS



Patent Pending

Cut downtime with "quick-change" rod packing cartridge

- 2,000 P.S.I.
- J. I. C. STANDARDS
- COMPACT DESIGN
- OPTIONAL ROD SIZES
- ALL-STEEL CONSTRUCTION
- 11 TYPES OF MOUNTINGS
- 11 BORE SIZES—1½" TO 8"
- UP-TO-DATE ENGINEERING



The S-P "quick-change" packing cartridge is easily removed for servicing seal or wiper. ***Cuts downtime . . . speeds production.*** S-P Hydraulic Cylinders have ***every*** modern design feature. Representatives in principal cities. Prompt deliveries. Send for Catalog 104. The S-P Manufacturing Corp., 12415 Euclid Ave., Cleveland 6, Ohio.

THE S-P MFG. CORP. — Cleveland
A Bassett Company
PRECISION PRODUCTS SINCE 1916
AIR AND HYDRAULIC CYLINDERS • POWER CHUCKS • ROTATING AIR CYLINDERS
COLLET AND DRILL PRESS CHUCKS • AIR PISTONS, VALVES AND ACCESSORIES

Tool Show | in Print

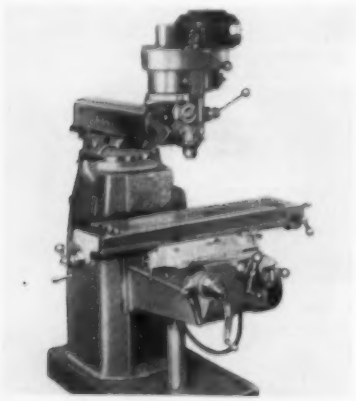
Unipunch Perforating Units

Series B for straightline, staggered, and over-all gang-punching setups on templets, T-slotted plates and rails in presses and press brakes are equipped with two-piece punches. Punch heads may be used and reused on inexpensive punch bodies.

Lowcost, snap-on strippers, furnished blank, eliminate individual stripping guide buttons for each size punch tip. Die retainer blocks, designed into front of holder's base permit quick interchanging of die buttons without removing units from the setup, or disturbing other parts.

Line is designed around the standard 5½-in. shut height and 2 19/32-in. die height for punching round, shaped, and clustered holes up to 3½ in. in dia in material up to 1/8-in. thick.

Punch Products Corp, 3800 Highland Ave, Niagara Falls, NY **Booth 191**

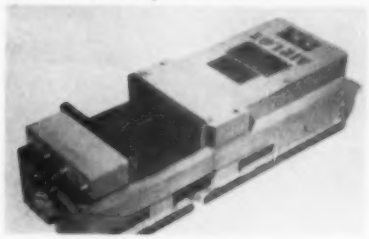


Vertical Milling Machine

Features of the 2UVR include a fully universal head; variable-speed spindle drive; variable quill feed; automatic collet closer; roller spindle drive; spindle brake; enclosed micrometer depth stop; one-clamp turret lock; built-in power table feed; rapid traverse; one-shot oiling system.

Spindle speeds are from 60 to 3300 rpm. Power quill feed has range of 0.0015 to 0.008 ipr. Table is 10½ x 42 in. Unit is powered by a 1½-hp motor.

Tree Tool & Die Works, 1600 Junction Ave, Racine, Wis **Booth 605**

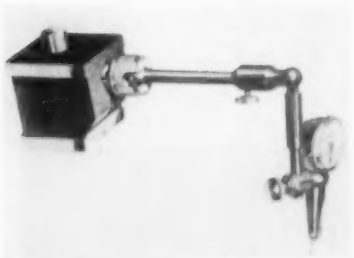


Airlox Pneumatic Vises

Model S-30 is equipped with pressure grease system in the movable jaw. Each time grease is applied to jaw fittings, not only is the jaw completely lubricated, but chips, dirt, or foreign matter is pushed out from under jaw.

All Senior Vises are furnished with this system, and are powered by the Airlox air-operated wedge with levers mechanism. Grip up to 10 tons is available in various models, from 100 lb of airline pressure.

Production Devices Inc, Whitehall, NY **Booth 795**



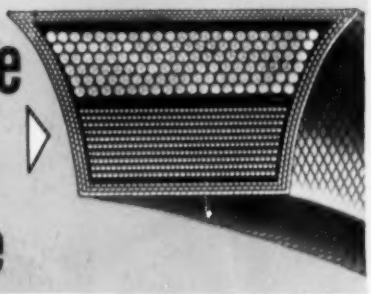
Magnetic Indicator Holder

Magnetic-base indicator holder, designed to simplify and speed up setup, checking and inspection jobs requiring dial indicators, holds firmly to any iron or steel surface in any position—horizontally, vertically or upside down. Large dia pushbutton turns magnet on and off, making it possible to position base with one hand. V-step across base top permits mounting on curved surfaces, and tapped hole on side provides second mounting position for the indicator post. It also permits use of two posts for multiple inspection. Base can be supplied with No 657F indicator swivel post assembly that holds a No. 711 "Last Word" indicator, or a No 196B universal dial test indicator. Base can also be furnished with upright base post, swivel post snug and gage holding rod for No. 25 series dial indicators.

Base is 1 15/16 in. high x 1⅝ in. x 1⅞ in. Swivel post assembly is 6⅛ in. high.

L S Starrett Co, Athol, Mass **Booth 1116**

Why this curve lengthens V-belt life



THE CONCAVE SIDES (U.S. Patent 1813698) of every Gates V-Belt are a precisely engineered curve. This curve greatly lengthens V-belt life for this interesting reason:

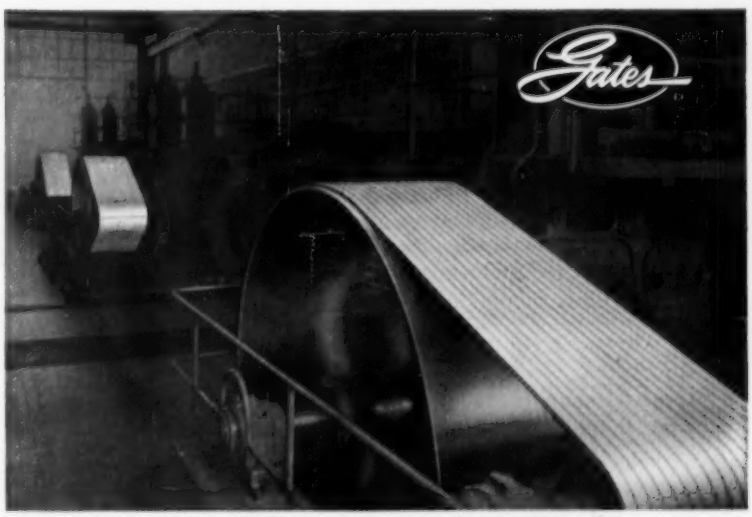
When you bend a Gates V-Belt, just as it is bent around a sheave, the concave sides (Fig. 1) become straight. Therefore, the belt makes full contact with the sheave, gripping the sides evenly (Fig. 1-A) and wear is distributed uniformly across the sidewalls of the belt. Naturally, uniform wear lengthens belt life; saves on replacement costs and cuts down-time.

Now see what happens when you bend a straight-sided belt. (Fig. 2) Just feel the sidewalls *bulge out* at the bend. The bulge causes *uneven* contact with the pulley, as in Fig. 2-A. And uneven contact causes excessive wear at points shown by arrows; belt life is shortened.

Cut costs by getting longer wear from your V-belt drives. Specify Gates Vulco Rope—the V-belt with concave sides. Your nearby Gates distributor will supply your needs promptly. The Gates Rubber Co.—*World's Largest Maker of V-belts.*

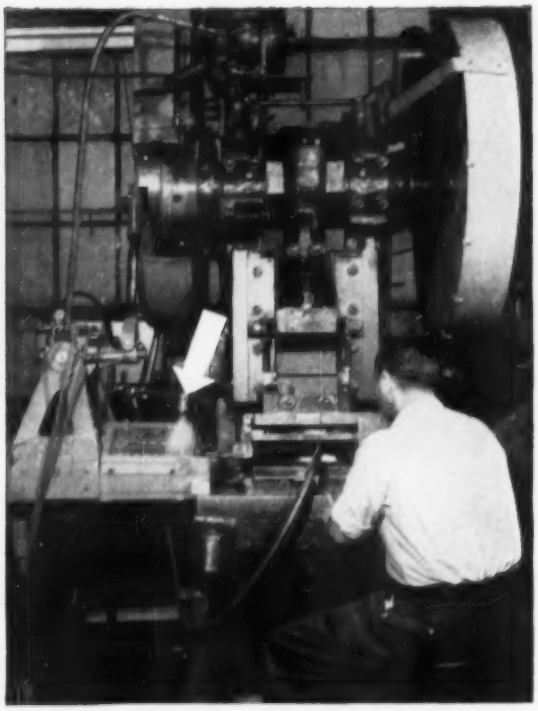
There are Gates Engineering Offices and Distributor Stocks in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

TPA-74



Gates VULCO ROPE Drives

Before: *This operation typifies how the Toledo Pressed Steel Company formerly hand-lubricated and fed aluminum flat stock to a punch press. Job was messy, slow, left stamping excessively greasy.*



After: *Two DeVilbiss spray guns now automatically apply the exact amount of lubricant required. Both sides of stock get uniform coating in specific areas.*

Use of compound cut 59%!

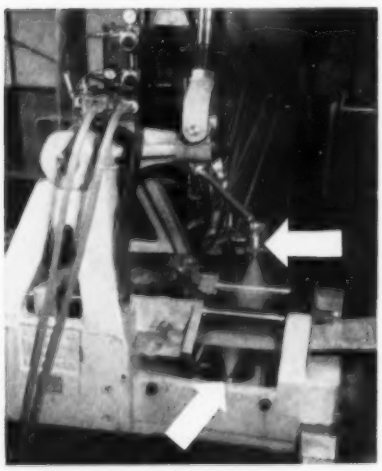
Stamping output upped 100%!

Applying drawing compound with automatic spray

By using two DeVilbiss guns to automatically apply drawing compound — the Toledo Pressed Steel Company, Toledo, Ohio, is able to reap all the benefits of automatic stock-feeding.

Now, as the aluminum coil stock feeds to a 50-ton punch press, the DeVilbiss guns automatically spray both sides — and only on those areas requiring lubrication. This accurate, uniform coating has reduced compound use 59% over former roller-application method; made the entire operation cleaner; and greatly reduced tears and breaks in the stampings. Thanks to DeVilbiss spray, output is doubled!

Why don't you investigate today. In addition to speeding production, saving drawing compound, reducing scrap and press cleanup time — the DeVilbiss spray method eliminates "hit or miss" lubrication and cuts operator fatigue. Contact your DeVilbiss representative.



The spray action of the guns is automatically synchronized with the mechanical slide feed.

THE DEVILBISS COMPANY

Toledo 1, Ohio

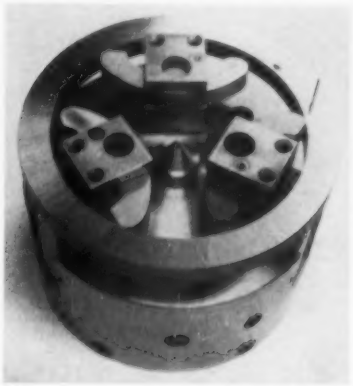
Santa Clara, Calif. • *Barrie, Ontario*

London, England

BRANCH OFFICES IN PRINCIPAL CITIES

FOR BETTER SERVICE, BUY

DEVILBISS

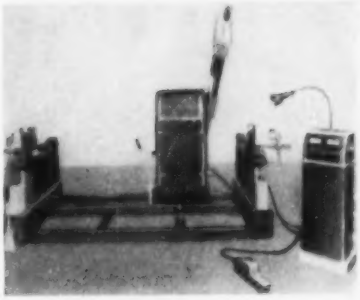


Compensating Chuck Has True Equalization

Compensation is improved by reducing friction and simplifying number of parts.

Advantages include ease of changing from one diameter to another; operates with machine running or stopped, permitting automatic loading and unloading; compensating mechanism increases gripping power, allowing more rapid stock removal; center can easily be set dead true. Unit can also be used as a standard power chuck when required.

Buck Tool Co, 2015 Schippers Lane, Kalamazoo, Mich **Booth 650**

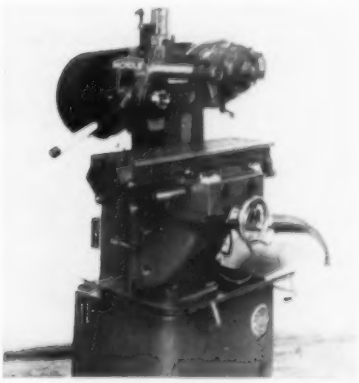


Stewart-Warner Balancer Handles 5000 lb

Model 708 electronic industrial balancer reportedly will balance any rotor weighing as much as a 2½-ton locomotive traction generator or as little as a 1-lb flywheel.

Unit has diametral range from 1 to 68 in. on any rotating piece. Kinetic sensitivity is 0.04 in.-oz; dynamic sensitivity is 0.25 in. 2-oz. Choice of direct or flat-belt friction drive is offered. Starting, braking, and speed adjustment are remote-controlled. Rotor is held down by a counterbalanced drive-belt arm. Set-up time is said to be only about 2 minutes.

Merrill Engineering Laboratories, 1240 Lincoln St, Denver 3, Colo **Booth 125**

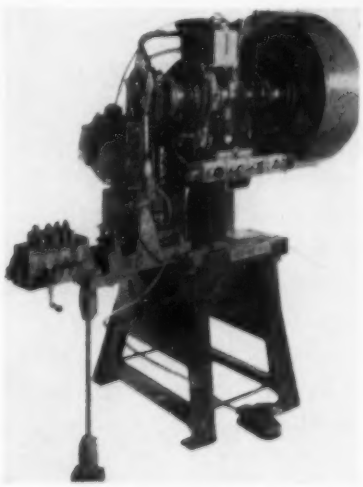


Semi-Automatic Miller

Heavy-duty Model 8-SA provides spindle speeds up to 5000 rpm. Features include 8½ x 30-in. table; 14-in. pneumatic longitudinal feed; heavier knee and saddle than on standard Nichols unit.

Machine can be furnished with pneumatic transverse feed and pneumatic rise-and-fall spindle movement. Automatic feeds in two directions can be synchronized to produce a fully automatic cycle.

Nichols-Morris Corp, Mamaroneck Ave, PO Box 430, White Plains, NY **Booth 351**



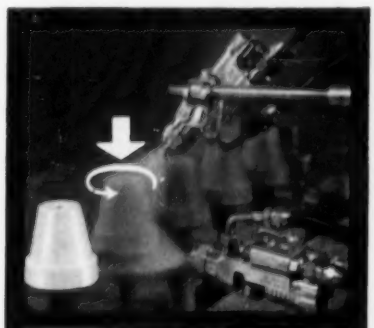
HIGH-SPEED OBI PRESS, Press-Rite No. 2, is 20-ton unit with operating speeds of up to 300 spm. Machine has a 1½-in. stroke. Other features include solid bronze gibs, automatic lubrication system, special flywheel, air counterbalance, Press-Rite Airflex air friction clutch and brake, and rotor seal timer limit switch—*Sales Service Machine Tool Co, 2363 University Ave, St Paul 14, Minn* **Booth 393**

Cut Painting Costs ...with DeVilbiss automatic spray!

Just load your product or part on a high-speed DeVilbiss spray machine, and *phffft . . .* it's painted *automatically* at less cost to you! Split-second timing, accurate gun positioning, and synchronized conveyor speeds prevent streaks, sags, and wasteful overspray. You actually *save* materials, as you produce consistently better, more uniform finishes in a fraction of the time consumed by manual methods. It is the only automatic method capable of spraying inside deep cavities, as well as uniformly coating exterior surfaces.

Know in advance the savings of automatic painting

DeVilbiss offers automatic spray machines for painting products of practically any size or shape, and for use with most conveyor systems. To have us run a test on your product, and report projected savings, call your nearest DeVilbiss representative who will gladly arrange a test in our research lab.

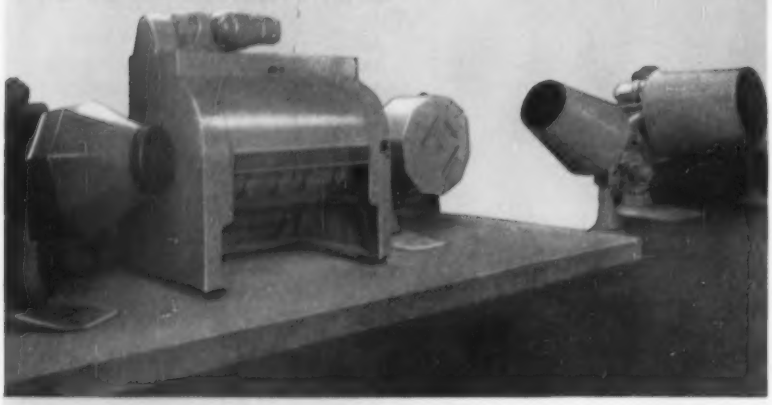


DeVilbiss automatic spray machine finishes 3¼" O.D. flower pots, up to 3600 an hour.

THE DEVILBISS COMPANY
Toledo 1, Ohio
Santa Clara, California • Barrie, Ontario
London, England
BRANCH OFFICES IN PRINCIPAL CITIES

FOR BETTER SERVICE, BUY
DEVILBISS

HERE'S WHERE YOU'LL GET ANSWERS



TO YOUR FINISHING PROBLEMS

Globe Tumbling Equipment will give your product a finer finish with *controlled uniformity*, at lower cost.

We can prove it — without cost to you. Just send samples of the part to be finished plus a complete part showing the finish you require. Whether you want exact tolerances with no dimensional change . . . whether you grind, deburr or polish a simple washer, a hardened steel hammer head, or a complicated multi-surfaced part . . . Globe Tumbling Equipment will improve the finish uniformly, do it faster and at less cost.

So before you make an investment in any finishing equipment, send our laboratory your samples. We'll analyze your product to determine the combination of equipment and abrasive material *best* suited for your job. The sooner you act, the sooner the results will be in. And we guarantee the same results *in your own plant* as we produce in our laboratory.

Globe BARREL FINISHING EQUIPMENT

DIVISION

CASALBI COMPANY

541 WAYNE STREET, JACKSON, MICHIGAN

Tool Show | in Print

Chilling Unit for Small Production Use

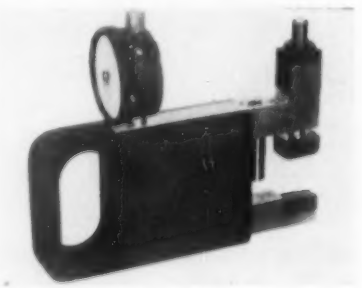
Cincinnati Sub-Zero's Model A-120-2 chilling unit provides low-temperature chilling for applications where moderately small capacity is needed. Portable unit has a temperature range from –70 F to –135 F, normally operates at –120 F. Net thermal capacity is 400 Btu's at –120 F.

Unit is said to chill approximately ten lb of steel per hour from +80 F to –120 F. Chamber size is 2 cu ft; outside dimensions are 32 in. long by 20 in. wide by 43 in. deep.

Optional equipment available includes observation window for top or front, blower for mechanical convection heaters for high-temperature testing, and recording instruments.

Cincinnati Sub-Zero Products, Reading Road at Paddock, Cincinnati 29, Ohio

Booth 665



Nilco Dial Snap Gage Has 1-in. Range

Dial snap gage that can be used in coolant or any soluble oil has no moving parts in the indicator that can corrode or rust, causing stickiness or inaccuracies.

Instrument has a 1-in. range with a vernier adjustment on the upper anvil. Plastic housing can be obtained to waterproof the indicator.

Nilsson Gage Co, Inc, 255 Mansion St, Poughkeepsie, NY **Booth 717**

When you want the *BEST*...

Boyar-Schultz
6x18 *HYDRAULIC*
SURFACE GRINDER

Compare these features—

1—Totally enclosed vertical and transverse ways, seal out grit and abrasive affording longer life.

2—Spindle column rides transversely on ground cylindrical bars, affording easier access to work area and guarantees closer accuracy in grinding.

3—Newly designed Hydraulic valve affords smooth, trouble-free stroke.

4—Automatic handwheel engagement allows fast change from hand feed to hydraulic, and vice versa.

5—J.I.C. Electrical Controls as standard equipment at no extra cost.

6—Hardened and ground tool steel bed ways affording long life and greater accuracy.

Available in both
HYDRAULIC or
HAND FEED Models

BOYAR-SCHULTZ CORPORATION

2012 SOUTH 25TH AVENUE, DEPT. C-N, BROADVIEW, ILLINOIS

See how
LINDNER
JIG BORER
direct-reading
micro-optical
measuring system
with "Autopositioner"

speeds initial and repeat table settings-guaranteed accurate within .00015"

readings in .00005" no gauges, blocks or bars

table sizes
44" x 24"
32" x 16"

SEND for 25-minute movie film demonstration

KURT ORBAN
COMPANY, INC.
36 Exchange Place
Jersey City 2, N. J.
In Canada:
2490 Eglinton Ave. W. Toronto

Tool Show | in Print

Rahn Calibration Kit

Kit consists of a granite straight edge, one solid and one adjustable support, and an indicator base.

According to the manufacturer, a 24 x 36-in. surface plate can be completely calibrated in 45 minutes; no calculations are required. Indicator readings are taken under a straight edge, adjustably mounted so that it can always be supported in the exact reference plane. Precision of calibration is limited only by precision of indicator being used. Precision of 10 millionths of an inch can be attained with electronic indicators.

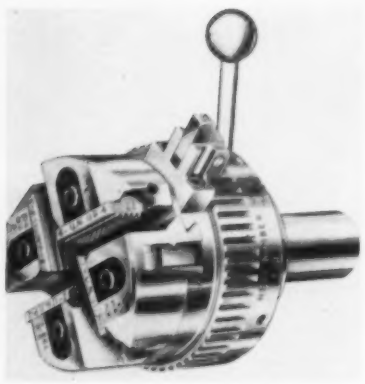
Rahn Granite Surface Plate Co, 641 N Western Ave, Dayton 7, Ohio **Booth 928**

Webber Gage-Block Sets In Linear and Angular Types

"Laboratory Master" gage-block sets come in two types, linear and angle (illustrated). Linear blocks are certified accurate to ± 0.000001 in., angle blocks to ¼ second. Blocks are not intended for use as working blocks, but enable precision manufacturer to have his own gaging laboratory for checking his working blocks against these master sets.

Gage blocks are made of solid chrome carbide, and are individually calibrated for accuracy by Zeiss interferometer which uses wave length of light as its standard of measurement.

Webber Gage Co, 12900 Triskett, Cleveland 11, Ohio **Booth 936**



Redesigned Threading Heads

All Landmatic hardened and ground die heads now incorporate a rapid-change size-adjusting mechanism which also provides precision movement and positive locking action.

It consists of a pivoted latch held in engagement with notches on adjusting ring by spring tension. To adjust the head, latch is depressed and adjusting ring is rotated the required amount by hand. Notches are positioned on ring so that movement of one notch will provide corresponding movement of 0.0005 in. on the PD of the work.

Landis Machine Co, Waynesboro, Penna **Booth 578**

Micro-Fog Lubro-Control Unit

Model 33AF-16 incorporates devices which automatically actuate controls or alarms when air pressure fails, when oil supply needs replenishing, or when excessive pressure develops in oil reservoir.

The 12 x 11 x 9-in. cabinet contains a 2-gal. oil reservoir, sufficient for continuous lubrication of 500 bearing inches over a period of 24 hr, or reportedly ample for continuous lubrication of 1000 bearing inches for 12 hr.

C A Norgren Co, 3400 S Elati St, Englewood, Colo **Booth 325**

See why Tool Engineers call these heavy producers,

"MOST MODERN MACHINES OF THEIR TYPE"

Hydraulic pre-selection of speeds set by handwheel and read on illuminated dial. 16 spindle speeds—ratio 1:50—up to 310 rpm for carbide machining on Model KE 100. Table runs on tapered roller bearings.

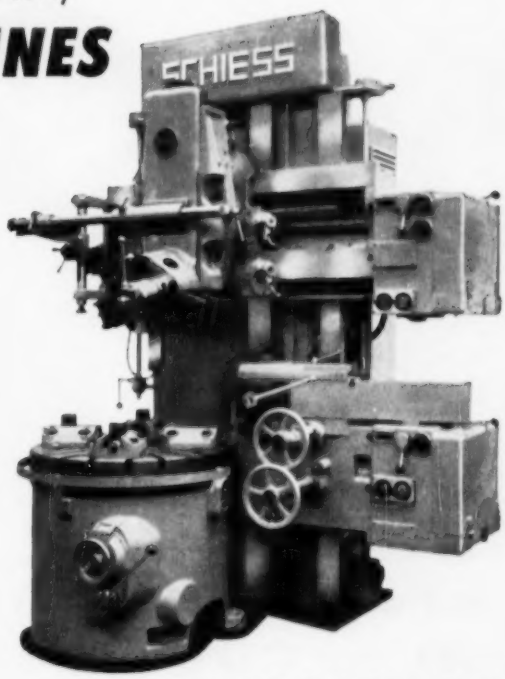
Fingertip control for direction of feed and rapid traverse with spring-loaded mono-levers for normal direction plus angular compound feeds. Mono-levers move in same direction as desired feed or traverse movement, simplify correct setting by operator. Specially designed electro-magnetic disc clutches disengage feed instantly with no over-riding or coasting.

Counterbalanced cross rail and side head. Single lever unlocks, raises or lowers, and locks cross rail simultaneously by electro-mechanical controls. *No bolts or nuts to loosen or tighten by hand.*

Magnetic dry particle clutch provides vibration-free drive for smooth surface finish. Power is transmitted via belt to clutch from main motor mounted on left side of machine. Instantaneous braking is assured by magnetic dry disc brake.

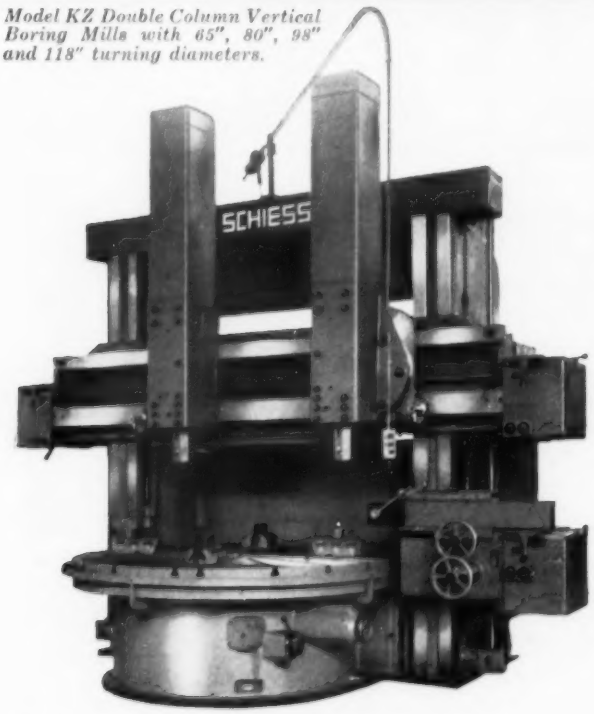
Copying attachment with electric tracer for use on cross rail or side head.

See it tracing tire molds at ASTE Show—Booth 305



Model KE Single Column Vertical Turret Lathes with 40", 50" and 65" turning diameters for high-speed carbide machining.

Model KZ Double Column Vertical Boring Mills with 65", 80", 98" and 118" turning diameters.



All operating features of KE Series Vertical Turret Lathes are combined in

SCHIESS KZ DOUBLE COLUMN VERTICAL BORING MILLS, PLUS—

Heads equipped with steel octagon rams can be swiveled—have automatic feed in vertical, horizontal and angular direction and are independent of one another as to amounts and direction of feed. Table operated by three-button pendant control. Standard model KZ Double Column Vertical Boring Mills are available with 65", 80", 98" and 118" turning diameters.

Get to know these products of Europe's largest builder of heavy machine tools. Parts and service are as close as Pittsburgh. An American Schiess engineer will be happy to help you size up these heavy producers for your heavy production needs. Write for catalogs and complete specifications on these and all Schiess KE machines.

Engineering Division

AMERICAN SCHIESS CORPORATION

1232 Penn Ave., Pittsburgh 22, Pa.

Sole Distributor

KURT ORBAN COMPANY, INC.

34 Exchange Place, Jersey City, N. J.

Need rivets of AL, FE, NI, or CU?

Milford makes rivets from a wide variety of metals, alloys, platings and finishes!

Any wire material that can be cold-formed can be manufactured into a wide variety of precision rivets by Milford.

Semi-tubular, full-tubular, bifurcated, cutlery, special decorative rivets—Milford cold-forms them all. It's Milford cold-forming that makes possible the low cost, excellent finish and inherent strength of both Milford Rivets and the finished product.

To cut delivery time and production costs, to improve product appearance, to assemble your product on automatic rivet-setting machines—get in touch with Milford!

VISIT US AT BOOTH 453
"TOOL SHOW"

THE MILFORD RIVET

MILFORD RIVET & MACHINE CO.

MILFORD, CONNECTICUT • HATBORO, PENNSYLVANIA
ELYRIA, OHIO • AURORA, ILLINOIS • NORWALK, CALIF.

Tool Show | in Print

Precision Index Tables

Ferguson Intermittor line of high-speed, precision index tables is reported capable of attaining production speeds as high as 30,000 pieces per hour. Line includes more than 150 standard models, with dial sizes ranging from 12 to 60 in. and numbers of stations varying from 4 to 36.

Power section for table, called the Vari-Dwell, synchronizes action of the tooling to the index table and provides either remote control of dwell or direct drive with the clutch acting as a safety mechanism. A standard stand also is available.

Ferguson Machine & Tool Co, Box 5841, St Louis 21, Mo **Booth 350**

AIRFOIL MEASURING MACHINE, Model 105, provides direct-reading, single-operation method of inspecting airfoil contours on jet-engine blades and similar shapes. Instrument measures errors directly from 10:1 ratio glass or vinyl charts which are used as the basic information, starting with the design through all stages of manufacture, of these irregular and twisted contours—*New England Tool and Machine Co, 913 Farmington, Berlin, Conn* **Booth 461**

Tool Steel Topics

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Shear Blades Last Twice As Long When Fabricator Changes to Bearcat

For many months a Midwestern fabricator had been using shear blades made of an alloy tool steel. The blades were used in cutting steel reinforcing bars and joists. Production was fairly good, too, as each blade sheared approximately 400 tons of material per side before being redressed.

Then he decided to try, in the same operation, a blade made of Bethlehem Bearcat tool steel. The blade, hardened to Rockwell C-59, was put to work shearing both ¼ in.-x-4 in. plate steel, and reinforcing bars ranging in diameter from ⅜ in. to 1¼ in. The advantage of longer wear and greater economy was soon apparent, for the new blade handled more than 830 tons of material per side —more than twice the tonnage which had been sheared by the former blade.

Bearcat is a tough, general-purpose air-hardening tool steel. It has superior resistance to wear, and is also exceptionally resistant to shock. Bearcat has an air-hardening characteristic, which minimizes quenching hazards and also provides good resistance to distortion in heat-treatment.

In addition to shear blades, Bearcat tool steel can be used economically for such varied items as chisels, punches, gripper dies, rivet sets, hot headers, master hobs and die-casting die inserts.

Why not put in an order for a trial piece of Bearcat today, while you have it in mind? You can't lose by giving it a workout. All you need do is get in touch with your Bethlehem tool steel distributor. He's as near as your telephone. Or order direct from our mill depot.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Blind Holes Are Dangerous

Without proper care, blind holes can be troublesome in the heat-treatment of tools. Typical of blind holes which usually get little attention are holes for studs or dowel pins. The exposure of blind holes to liquid-quenching produces extremely high internal stresses, with the possibility of cracking the tool during heat-treatment, or in service.

If it is not required that blind holes be hard internally, trouble can be avoided by packing the holes, prior to quenching, with clay, asbestos rope, steel wool, or a steel plug. Blind holes are particularly objectionable if they are required to be uniformly hard on the inside surface. This requirement can be met consistently only by using air-hardening steels.

"Teamwork" is the title of a 16-mm color film, with sound, recently released by Bethlehem. The film describes the manufacture of Bethlehem tool steel, and explains its quality-control and heat-treatment. Typical applications of carbon, oil- and air-hardening, shock-resisting, hot-work, and high-speed grades are included.

Prints of this 30-minute film are available for showing to distributors, heat-treaters, die-makers, machinists and machine-tool manufacturers, as well as to technical societies and engineering students. If you would like to see the picture, just write to Publications Department, Bethlehem Steel Company, Bethlehem, Pa. It would be well to select a showing date as far in advance as possible.

WIN $2000.00
IN THE WENDT-SONIS TOOL HOLDER "CUT COSTS" CONTEST

New! Different! Interesting! Easy too . . . and you win two ways in the Wendt-Sonis "Cut Costs" Contest. Who's eligible? Anyone employed by a company using the new superior Wendt-Sonis tool holder for throw-away inserts — a proven cost cutter. Keep a record on how you did it — how you "cut costs." Enter the facts on a simple-to-fill-out entry blank — send it to Wendt-Sonis Company for a chance at the prizes. Contest closes June 30, 1956. You win two ways — a chance at the prize — your job done at lower cost with Wendt-Sonis tool holders for throw-away inserts.

briefly — here's all you do . . .

1. Use the coupon below to get your entry blank and clear-cut easy-to-understand contest rules.
2. Be sure you have Wendt-Sonis tool holders for throw-away inserts on your job.
3. Jot down the facts and figures on the job for filling in the standard entry blank. You can base your example on lower tooling costs . . . less downtime . . . more parts per hour . . . *all* of these three . . . or any other savings you accomplished with Wendt-Sonis tool holders for throw-away inserts. Don't worry about neatness, spelling or size and type of job. Enter more than one job if you wish!

Don't be concerned about our using your name or company name in advertising. We wouldn't do that without getting your permission first.

$5000.00 IN PRIZES

1st $2000.00
2nd $1000.00
3rd $ 500.00
4th $ 250.00
and 25 $50 PRIZES
for
DOING YOUR JOB BETTER . . . AT LOWER COST

CONTEST JUDGES

John Greve
Executive Editor
Tool Engineer

Jerome S. Wilford
Executive Editor
Production Magazine

Elmer J. Tangerman
Executive Editor
American Machinist

GET YOUR SIMPLIFIED ENTRY BLANK RUSH!

CLIP — mail now!

"Cut Costs" Contest
Wendt-Sonis Co.
Dept. AM-356, Hannibal, Mo.

I want a chance to win in the Wendt-Sonis Tool Holder "Cut Costs" Contest. Rush me rules and entry blank.

COUNT ME IN!

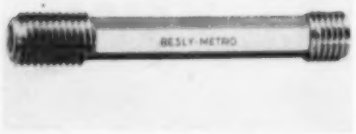
NAME _____ POSITION _____

FIRM _____

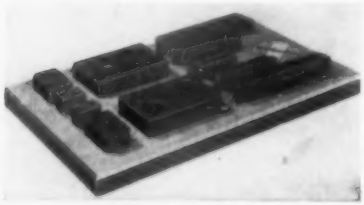
ADDRESS _____

CITY _____ ZONE _____ STATE _____

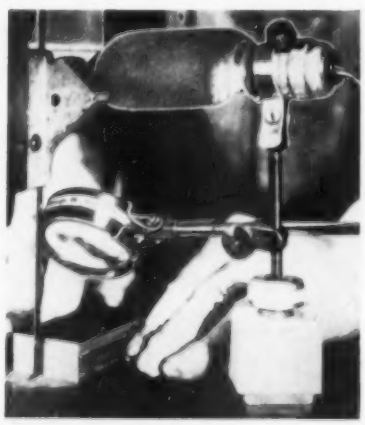
Tool Show | in Print



THREAD PLUG GAGE is addition to Besly-Welles line, which also offers other gaging items: thread ring, thread-setting plug, plain cylindrical plug, plain cylindrical ring, and master-setting disks. Company is also offering complete line of carbide-tipped standard and special tools in a wide range of types, sizes, and styles—*Besly-Welles Corp, 120 Dearborn Ave, Beloit, Wisc* **Booth 637**



Step Block and Clamp Sets
Sets are available for hold-down bolts from ⅜ through 1-in.-dia. Standard blocks are 1 in. wide; heavy-duty, 1½ in.; double-duty, 2 in. The ½, ⅝, and ¾-in. clamps are furnished with heavy-duty step blocks.
Northwestern Tool & Engineering Co, 114 Hollier Ave, Dayton 3, Ohio
Booth 301



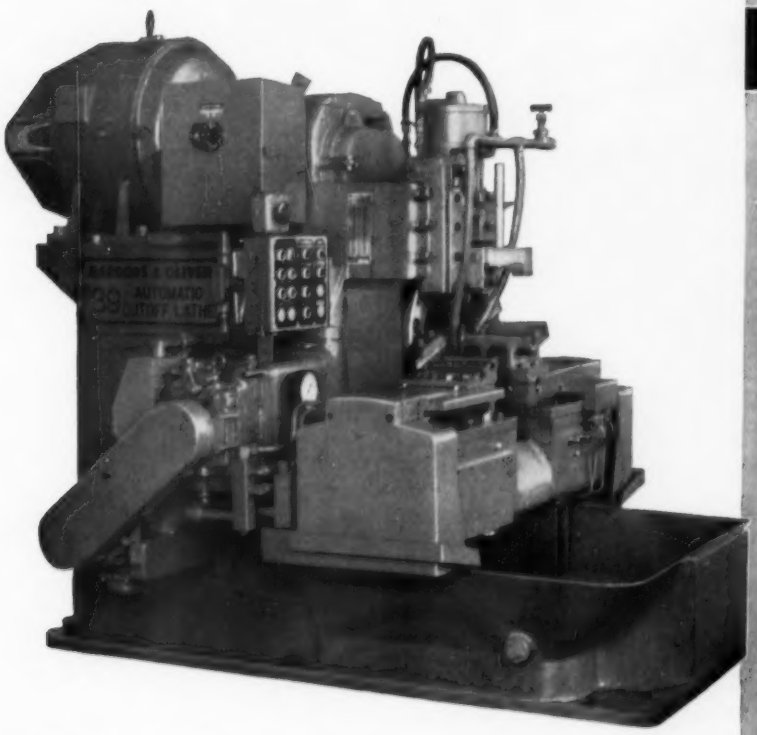
TINY-TITAN NO. 220 consists of magnetic base, 11/4 x 17/16 x 11/2 in. high, 65-lb pull; 2-in.-dia magnifier, 5X, that can be turned at any angle or plane; and shielded lighting unit, adjustable to any level or angle—*Enco Manufacturing Co, 4520 W Fullerton Ave, Chicago 39, Ill* **Booth 651**

BARDONS & OLIVER

MILL TYPE CUTTING-OFF LATHES

✓ FULLY AUTOMATIC FOR COUPLING WORK

✓ SEMI-AUTOMATIC FOR CROPPING WORK



ADDITIONAL SIZES OF BARDONS & OLIVER CUTTING-OFF LATHES			
No. 32 —	Capacity from	¼" dia.	to 2" dia.
No. 33 —	" "	½" dia.	to 3" dia.
No. 34 —	" "	¾" dia.	to 4" dia.
No. 35 —	" "	1" dia.	to 5-⅝" dia.
No. 36 —	" "	1½" dia.	to 6⅝" dia.
No. 38 —	" "	2⅜" dia.	to 8⅝" dia.
No. 39 —	" "	2⅜" dia.	to 9⅝" dia.
No. 312 —	" "	4½" dia.	to 12¾" dia.
No. 316 —	" "	6⅝" dia.	to 16" dia.

We also manufacture a complete line of Turret Lathes

FEATURING

HIGHER SPEEDS AND GREATER POWER FOR INCREASED PRODUCTION

- Spindle speeds up to 300 R.P.M. with up to 30 H.P. motor
- More rugged, dependable double tool slides
- Increased chucking power

Optional Extras

- Automatic or semi-automatic outside and inside chamfering attachments
- Speed accelerating device for cutting off solid bars
- Automatic stock loading tables
- Automatic stock unloading tables

BARDONS & OLIVER, INC.

1134 WEST 9TH STREET • CLEVELAND 13, OHIO

A TRANSPARENT ALL-CHEMICAL SOLUTION FOR GRINDING

Lusol K-7 is a new all-chemical liquid concentrate designed for a wide variety of grinding operations. It is recommended for use on all steels and is particularly suited for cast and malleable irons, titanium, carbon, rubber, ceramics and plastics. Instantaneously soluable in any water, hard or soft, it forms a clear, transparent, colorless solution that resists contamination, settles chips super-fast, and remains clear after repeated use. It is non-foaming and runs absolutely flat under all conditions. It provides maximum rust protection for all ferrous metals, including cast and malleable irons. It maintains clean wheels at all times. They just don't load up when you use Lusol K-7. For better grinding every time, use Lusol K-7. Write for complete information.

THE Lusol LINE

VISIT BOOTH 467—A.S.T.E. SHOW

. . . BETTER PRODUCTS FOR BETTER METAL WORKING

F. E. ANDERSON OIL CO., INC.

PORTLAND, CONNECTICUT

8AO88

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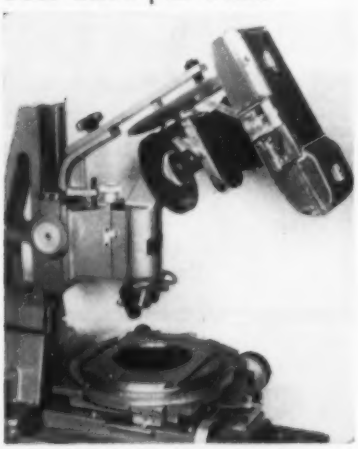


TOOLMAKERS' MICROSCOPE in latest model by Gaertner has a Land Polaroid camera attachment which permits taking photographs through the microscope of any given setup. With camera, photographs can be developed and viewed within 60 seconds—*Gaertner Scientific Corp, 1201 Wrightwood Ave, Chicago 14, Ill*

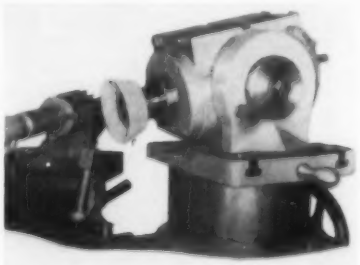
Booth 1126

6-ton Tube Bending Press

Model has been especially designed to increase production of U-bends not requiring a mandrel. Tubing up to 1⅛-in. OD can be formed to a 3-in. or larger radius.

Unit will bend two tubes simultaneously, making two bends in each to form a U frame. Die centers are adjustable from 12 through 19 in.; bends can be made to any angle up to 90°. Vertical-actuated ram is hydraulically powered; horizontal wing dies operate against air cushions. Hydraulic pump is powered by a 15-hp motor. Floor space is 44 x 72 in.

Pines Engineering Co, 601 Walnut St, Aurora, Ill **Booth 197**



MOTORIZED TOOL AND CUTTER GRINDER SPINDLE has swivel head which provides angular adjustment on both axes and permits use of cup wheel for practically all clearance angles—*Pope Machinery Corp, Haverhill, Mass*

Booth 392

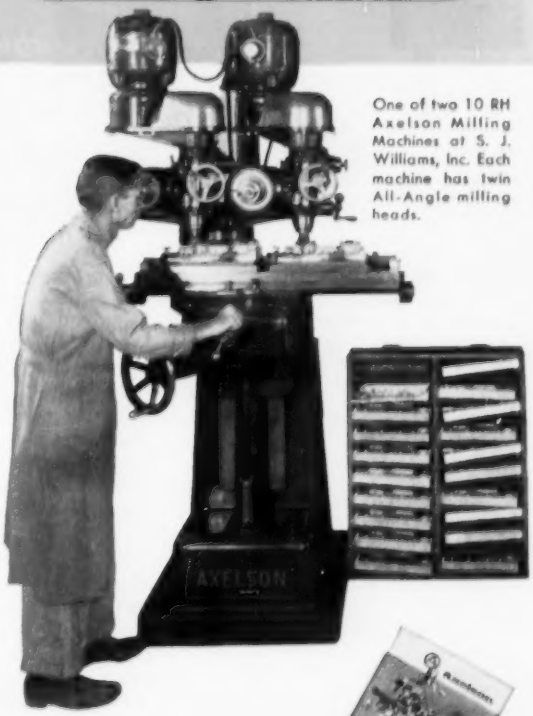
"our twin-head AXELSON doubles production of a job we handle with kid gloves"

Mr. S. J. Williams operates S. J. Williams, Inc. in Schiller Park, Illinois.

"When we get a real ticklish job, we handle it with care. These precision radar equipment housings, for example. We built special cabinets to stack them separately while they're in process.

"The Axelson makes it possible to produce two housings in the same setup, because with our Axelsons we can use two identical milling heads on the same machine. No problem of holding tolerance even at the exceptionally high speeds we use. Surface finish is excellent. Spindles can be adjusted in exact relationship to each other. For duplicate milling, you can't find a better setup.

"I know there are all kinds of fine milling machines on the market and all kinds of prices too. But our Axelsons do the job for us. That's why we have two of them."



One of two 10 RH Axelson Milling Machines at S. J. Williams, Inc. Each machine has twin All-Angle milling heads.

Write for free catalogs on Axelson Milling Machines.

AXELSON
MILLING MACHINES
make man hours mean more

Producers of the World famous Axelson Lathe

AXELSON

AXELSON MANUFACTURING COMPANY
DIVISION OF U. S. INDUSTRIES, INC.
6160 S. BOYLE AVENUE, LOS ANGELES 58, CALIFORNIA • Dealers in Principal Tool Centers of the U. S.

NEW Wells MODEL 600

METAL CUTTING BAND SAW

Larger Capacity plus Wells Quality for Greater VALUE and PERFORMANCE

Wet cutting system shown is an optional extra. Casters available for easy portability.

SELECT FEATURES

- Exclusive Wells "constant-load," foolproof blade tensioning.
- Safety Switch with thermal overload protection and automatic stop features.
- Uses Blade ⅝" wide for more accurate cutting.
- Sealed type ball bearing motor for Full Power at Low Cost.
- Efficient V-belt drive—4 selective speeds.
- Easily adjusted ball bearing guides for stabilizing the blade.
- Extra rigid, heavy-duty cast iron frame and I-beam.
- Adjustable, uniform gravity feed of counterbalanced frame.

SPECIFICATIONS

CAPACITY:	
Rectangular	6" x 13"
Rounds	6¾" dia. or 6" pipe
45° angle	5" x 5"
SPEEDS, ft. per min.	50, 90, 160, 250
BLADE SIZE	⅝" x .032 x 8' 2½"
MOTOR	½ H.P.
WIDTH OF BED	8½"
FLOOR TO TOP OF BED	25½"
FLOOR SPACE	21" x 50"
SHIPPING WEIGHT, approximate	375 lbs.
with coolant	425 lbs.

Now you can get the larger capacity you've been looking for in a Quality Built, Moderately Priced horizontal metal cutting band saw. Designed and built by Wells Manufacturing Corporation to give you BIG Value and OUTSTANDING Performance, the New Model 600 is the answer to metal cutting for medium and small production jobs, general utility, or tool and stock room work.

Big capacity—6" pipe—is only part of the story. The Model 600 offers Wells Quality throughout. A few of these features are listed at the left. The combination of these features makes it possible to do a better job of cutting at a lower unit cost.

Set up a Model 600 in your shop. Put it to the test—You'll see metal cutting at its best.

Call your Wells Distributor for all the details, or write for descriptive information.

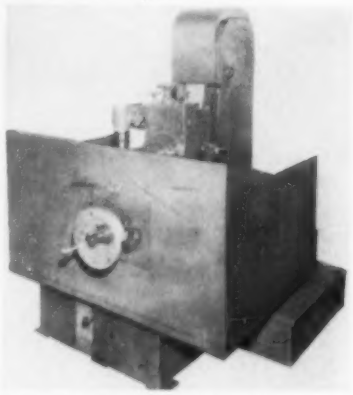
Wells Saws

Wells

The Pioneers of Horizontal

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 Roosevelt Rd. Three Rivers, Michigan



Centerless Grinding Machine Handles 1-in. Bar Stock

Production Machine's Type 486 centerless grinding and finishing machine was developed to fill need for precision machine for light-duty work. Machine will handle bar stock up to 1-in. diameter and tubing up to 3-in. diameter, any length, within weight limitations of machine.

Unit employs abrasive belts running over a hardened-steel contact roll as cutting medium. Feed unit is also an abrasive belt with flat platen which permits centerline contact with work at any feeding angle. Feed unit may also be equipped with reversing traverse device when multiple passes are required.

Other specifications: size of grinding belt, 4 x 86 in.; belt speed, 3500 sfpm; size of feed belt, 6 x 29¾ in.; main drive motor, 3 hp 1200 rpm; floor space, 60 x 50 in.

Production Machine Co, Greenfield, Mass **Booth 625**

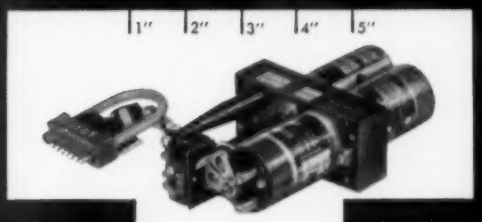
Flexible Epoxy Suitable For Drop-Hammer Dies

Rezolin flexible epoxy, No. L-940, is said to offer high dimensional stability and to allow customer to control degree of flexibility with one material. Resin produces a tough, resilient surface which will compress and eliminate need for metal clearance between punch and die. Surface of ¼ to 2 in. thick as required is cast on a metal core. The combination is afterwards used as a metal-forming punch utilizing a rigid epoxy for the die.

Other Rezolin epoxys include No. L-904, a white laminating resin for making duplicate masters, drill jigs, check fixtures, and spray masks; and No. L-914 white Gelkote resin, applied directly to a mold with a brush, for surfacing laminated tools.

Rezolin, Inc, 5736 W 96th St, Los Angeles 45, Calif **Booth 388**

Type 9 motor-driven induction generator driving two Type 11CT synchros through gear train having ratio of 1500:1. Slip clutch operates to permit one control transformer to be rotated when second control transformer has shaft restrained by stops. Cams close 2 switches during specified degrees of synchro rotation.



big control problem . . . small servo solution

Despite its small size and extreme compactness, this Transicoil plug-in servo assembly always "does the job right". That's because it was especially designed for a single application . . . by a company whose major function is solving individual servo control problems with complete, precisely engineered and manufactured servo assemblies.

Of course, if you just want servo *components*, Transicoil can provide them to the highest order of precision and accuracy. But it is in the "package" engineering of unique assemblies that Transicoil's experience and creative imagination offer the greatest value. And in most cases, these assemblies cost no more than the individual components would purchased separately. Check your next servo problem with Transicoil first. You'll find it pays — in precision, in space, and in economy. Ask for the new availability guide for precision gear motors at the same time.

Transicoil

CORPORATION

Worcester • Montgomery County • Pennsylvania

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insert tooling offers you—

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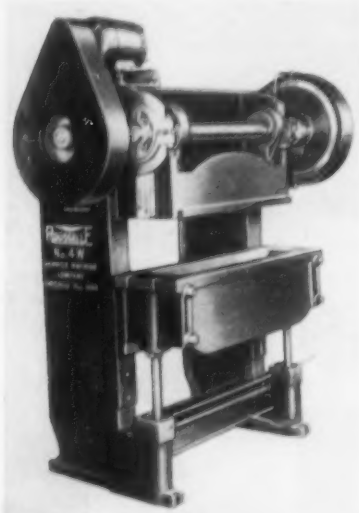
METALS CORPORATION
Box 205 • Royal Oak, Mich.

Tool Show | in Print



Rousselle Double-Crank Press Has Adjustable Bed

No. 4W double-crank gap press has a capacity of 40 tons. Standard stroke is 2 in., with special stroke of 3 in.

Bed has area of 14 x 48 in., with opening of 8 x 36 in. Machine is capable of 50 strokes per minute.

Other specifications: die space, bed-to-slide minimum, 5½ in.; area of ram, 9 x 36 in.; weight, 4000 lb; floor space, 34 in. front to back and 56 in. left to right.

Service Machine Co, 2310 W 78th St, Chicago 20, Ill **Booth 1506**

Shock and Vibration Mountings

Heavy-duty Adjust-O-Mount W339 has load range of 2000-10,000 lb. Designed for drilling, grinding, milling, and planing machines, it is said to be adequate also for shock forces encountered in punch presses or drop hammers.

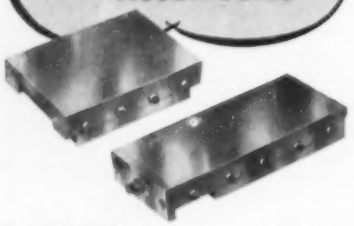
Model, which need not be bolted or lagged to the floor, has built-in leveling device.

Robinson Aviation Inc, Teterboro, NJ **Booth 117**

SAVE DESIGNING AND MANUFACTURING TIME
with these
***Standard* COMPONENTS FOR *Special* MACHINES**

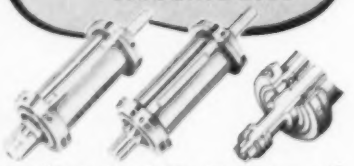
COMPLETE your *special* production equipment faster with *standard* components from this extensive line. Highest precision and quality—many sizes available from stock. *Get complete details!*

STANDARD *Slide* ASSEMBLIES



Available in 52 types and sizes. *Basic Type* includes male and female members, gib and gib screws. *Assembled Type* also has return springs, stop screw, Neoprene shield and mounting holes. Sliding surfaces furnished either *Milled* or *Hand Scraped.* Widths from 2″ to 6″—lengths from 3″ to 16″.

STANDARD *Spindle* ASSEMBLIES



Available in *Collet Type* for ⅛″, 3/16″ and ¼″ max. capacity collets; *Morse Taper Type* for No. 0 and No. 1 Morse taper shanks; and *Arbor Type* for shankless cutters with 0.375″ and 0.500″ center hole. *Standard Duty* has single row ball bearings at both ends; *Heavy Duty* has double row bearings at front.

WRITE now for FREE catalog!

RUSSELL T. GILMAN, Inc.
1246 Milton Ave.
JANESVILLE, WISCONSIN

Die Pad Pressure Device

Die-Draulic Grip for positive hold-down in drawing or forming eliminates springs and air pads, supplies pressure hydraulically without use of motors or pumps.

Control valve is set at about 3% above pressure required; this excess is roughly the compressibility of the oil and lines. Full pressure needed is thus available from very near the start of the stroke. Valve is said to have a large capacity flow per second than similar units currently available. Fluttering action is almost entirely eliminated, according to the manufacturer.

Die-Draulic Grip, Inc, 528 Butterworth St, SW, Grand Rapids 4, Mich
Booth 632

Blast-Cleaning Abrasives

Steeletts is designation for Wheelabrator steel-grit blast-cleaning abrasive for producing etched finishes. Material is high-carbon electric-arc furnace steel, specially heat treated to provide toughness required; abrasive is in same hardness range as chilled-iron abrasives, but is free from brittle carbides which cause breakdown of chilled iron.

Steeletts are available in seven sizes, ranging from G-16 down to G-120. All are screened to SAE size specifications.

Wheelabrator Corp, Mishawaka, Ind
Booth 146

Tube Piercing Unit

Wales tube piercing unit can be used in either press brake or punch press. Flat plates are used for mounting unit to bolster and ram plates of punch presses; keyed mounting plates are used for mounting units individually in a press brake.

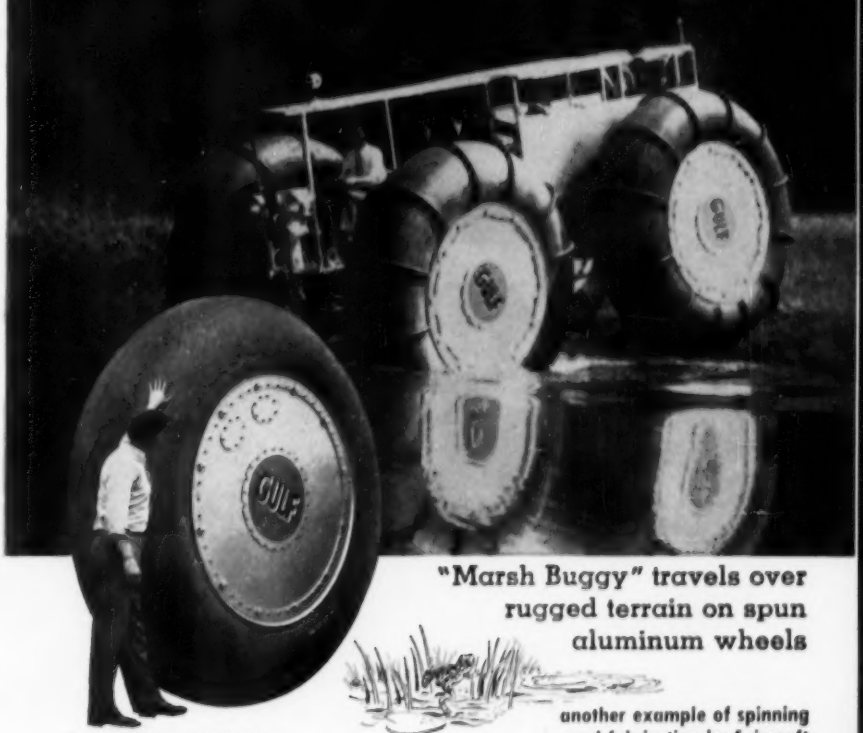
For a series of holes, mounting templets for mounting the desired number of units in the required positions can be supplied.

Capacity is ½ to 1-in-OD tube. Maximum punch diameter is 0.312 in. Maximum wall thickness of tubing is 0.093 in. Special units for larger holes and larger tubing can be supplied.

Wales-Strippit Corp, North Tonawanda, NY **Booth 379**

Spincraft did it for Gulf Oil...

Spincraft can do it for you!



"Marsh Buggy" travels over rugged terrain on spun aluminum wheels

another example of spinning and fabrication by Spincraft

13 DIFFERENT OPERATIONS

The "Marsh Buggy" rolls on sturdy, lightweight aluminum wheels — spun and fabricated by Spincraft. Even if all four balloon tires fail, the spun aluminum air-tight wheel drums will keep the vehicle afloat. Wheel flange segments, extensions, .118" thick 5280 aluminum stiffener ribs, No. 11 U. S. gauge (.125" thick) stainless steel front hub cones were machined and assembled to complete the wheels. In addition to spinning, Spincraft performed the following operations: welding, grinding, polishing, machining, punching, braking, drilling, tapping, sawing, riveting, assembly and testing.

Write for Spincraft data book. If you have a specific problem, tell us about it — no obligation.

WHEN Gulf Research & Development Co., a division of Gulf Oil Corp., contracted to build their world-famous "Marsh Buggy" for the U. S. Army, Gulf called on Spincraft to fabricate all four wheel assemblies.

These huge wheels are designed to bear loads of 1,500 to 4,000 lbs. Combining strength with lightweight, these tough aluminum alloy wheels can take grueling cross-country punishment. The 10-ft. dia. tires easily negotiate swamp, water, sand, deep mire and other difficult terrain, at speeds from ¼ to 40 miles per hour.

This is another example of Spincraft's versatility and manufacturing skill. Complete facilities are available for all types of contract manufacture — finished parts, assemblies and complete products. Take advantage of our modern tools for spinning and fabricating. They can pay off in savings for you, too.

WORKSHOP OF AMERICAN INDUSTRY SINCE 1919

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4136 WEST STATE STREET • MILWAUKEE 8, WISCONSIN

"RODGERS PLATEN PRESS GIVES US

FAST CYCLING WITH COMPLETE SAFETY"

—SAYS VEIT AND YOUNG

Rodgers 400-ton platen press in use at Veit and Young, Huntingdon Valley, Pa., metalworking specialists. The press is equipped with die cushion, fast cycling cylinders and other accessories. Some of the products formed are stacked by the press.

Higher, more consistent press cycling rates are maintained by Veit and Young press operators with the safety controls used on their Rodgers Platen Press. Complete operator-confidence in these safety controls means they can concentrate on speed and accuracy! At Veit and Young's Huntingdon Valley, Pa., plant they're working with type 303 stainless steel, brass, carbon steel and aluminum. Stock thicknesses range from 1/32" to 1/8" with bends up to 90°. Production has increased in the drawing and forming of large serving trays and electrical panels.

Fast cycling of this Rodgers Platen Press is made possible by auxiliary cylinders. They lower the big platen quickly to the die contact—raise it equally fast after die disengagement. Forming pressures can be pre-set from 80 to 400 tons. Holding pressures on the pneumatic die cushion range up to 50 tons! Veit and Young changes dies in an hour or less.

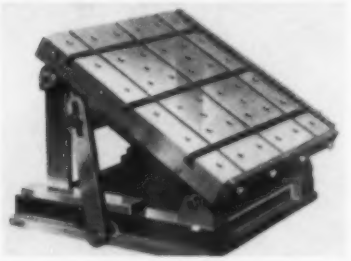
Rodgers Electro-Hydraulic Control System governs all platen, pressure and time cycles with simple, fast adjustments—for increased output! If you work in metal, plastics, rubber, veneers,—you can mold—draw—form *faster* with a Rodgers Platen Press. Capacities 10 to 600 tons, with plain or heated platen, up or down action, controls and accessories to suit your needs. Tell us your production requirements and send for Rodgers "Blue Ribbon" Platen Press Catalog.

HI-PRESSURE Rodgers HYDRAULICS

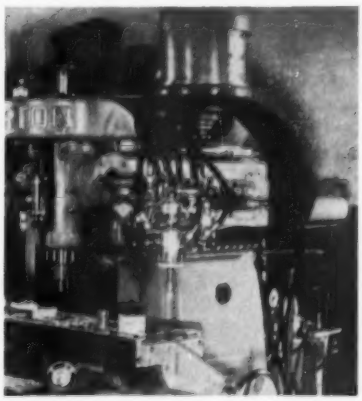
Rodgers Hydraulic Inc.

7407 WALKER STREET • MINNEAPOLIS 26, MINN.

Tool Show | in Print



12-IN.-SQUARE SINE PLATE is heavy-duty model in Robbins line, which includes heavy-duty plates for angular machining, "Magna-Sine" table for angular grinding, and inspection sine plate. All equipment has been redesigned. "Perma-Flat" swivel block incorporated in redesign is said to insure greatly extended service life—*Omer E Robbins Co, 24800 Plymouth Rd, Detroit 39, Mich* **Booth 416**



THREE-DIMENSIONAL TRACING INSTRUMENT, True-Trace A-3D, is shown attached to Gorton mill. Attachment converts milling machine to provide three-dimensional motion. Added feature is that existing manual feedscrews are retained—*True-Trace Sales Corp, 9830 E Rush St, El Monte, Calif* **Booth 760**

Star Drill Feeds At up to 60 ipm

Starbore drill is reported to produce precision through-holes from the solid at feeds up to 60 ipm in cast iron, aluminum, bronze, and steel. Carbide-tipped tool is claimed to produce holes with tolerances of 0.0002 in. and surfaces as smooth as 4 rms at 15-ipm feed.

Drill has off-center hole design that results in tool with combined advantages of oil-flute drill and a trepanning tool.

Star Cutter Co, Farmington, Mich **Booth 1329**

Which BUSHING SHOULD YOU USE?

Your choice is getting broader every day. Each of the guide pin bushings above is good—in the right application. But, some of them cost more than others. Which should you use for best results consistent with cost?

That's where Detroit Die Set can help you. In our 25 years of exclusively building die sets, we've tested a good many types of bushings. Based upon these tests and performance in our customers' plants, we stock and recommend a number of types of bushings for use in our die sets.

To aid you in bushing selection, we've prepared a bulletin on the subject. Just ask for Bulletin 56, and we'll send your personal copy without delay. Detroit Die Set representatives also will be glad to personally aid you in selecting the right bushings and die sets. They're as near as your 'phone.

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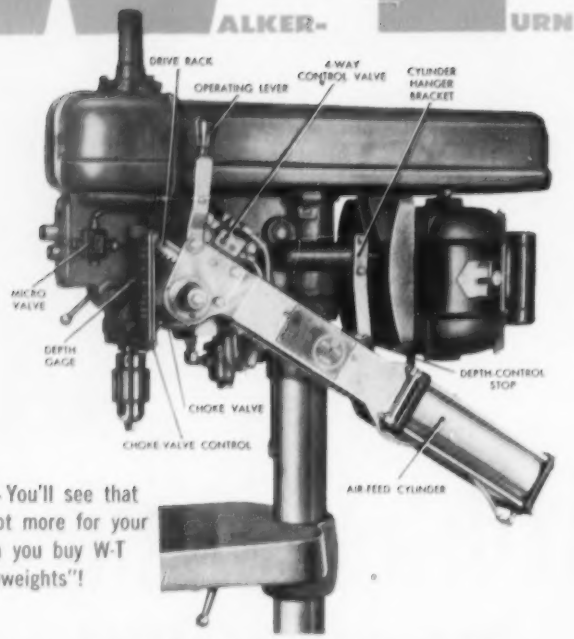
W-T

WALKER-TURNER



COMPARE — You'll see that you get a lot more for your money when you buy W-T "Light-Heavyweights"!

You can install this new time-saving, money-saving Air Feed in 10 minutes!

100% PNEUMATIC! NO ELECTRICAL CONNECTIONS! NO MACHINING! Wherever you have repeated drilling and related operations, this new Walker-Turner Air Feed will whittle down your costs and put you in a much better competitive position. It converts any Walker-Turner, or W-T type, Drill Press up to 1" capacity to a high production power-fed drilling machine. Gives sensitive, automatic feed control for a wide variety of production operations in metal or wood. Even short-run jobs are more profitable when you install Air Feed! . . . Air Feed Attachment for 15" and 20" Drill Presses, 4" and 6" spindle travel; prices start at $185. Air Feed-equipped Walker-Turner 15" and 20" Drill Presses, 4" and 6" spindle travel; prices start at $353. . . . Ask your Walker-Turner Distributor to *demonstrate*. He's listed under "Tools" in your phone book's Yellow Pages. Or write today for his name and your new, *free* Manual.

FREE! New 24-page Manual on application of Air Feed to drill presses

DRILL PRESSES, HAND AND POWER FEED — AIR FEED DRILL PRESS ATTACHMENT — RADIAL DRILLS — WOOD AND METAL CUTTING BAND SAWS — TILTING ARBOR SAWS — RADIAL SAWS — JIG SAWS — CUT-OFF SAWS — LATHES — SPINDLE SHAPERS — JOINTERS — BELT AND DISC SURFACERS — FLEXIBLE SHAFT MACHINES

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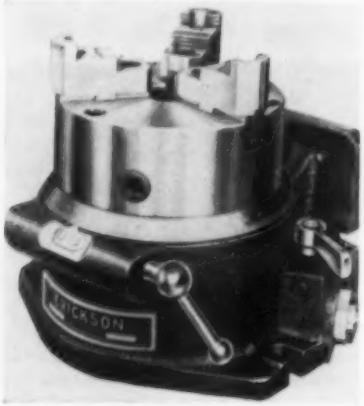
Kearney And Trecker Corporation • Plainfield, N. J.



Multi-Purpose Spacer

Erickson high - precision master spacer indexes work for a variety of machining jobs. Indexing accuracy is guaranteed within 0.001-in. cumulative error on a 6-in.-dia circle.

Timken bearing construction allows work to be trued in position with the brake off, because when it is clamped spindle alignment remains unchanged. Brake lever and index plunger lever are located on same side of unit for easy operation.

Spacer is designed to be used either horizontally or vertically. Other features: 24-position index plate, hardened and ground index plunger, interchangeable masking plates, and adjustable zero plate with degree graduations on the beveled face.

Erickson Tool Co, East 23rd and Hamilton Ave, Cleveland 14, Ohio

Booth 652

Noblewest Machine Marks 100 Pieces Per Minute

Model 442, a Series 21 dial-type marking machine, roll-marks permanent sunken impression into thin-wall tubes or sleeves on a production basis. Machine incorporates Noblewest process, wherein pressure is applied and a rolling action occurs between marking die and workpiece.

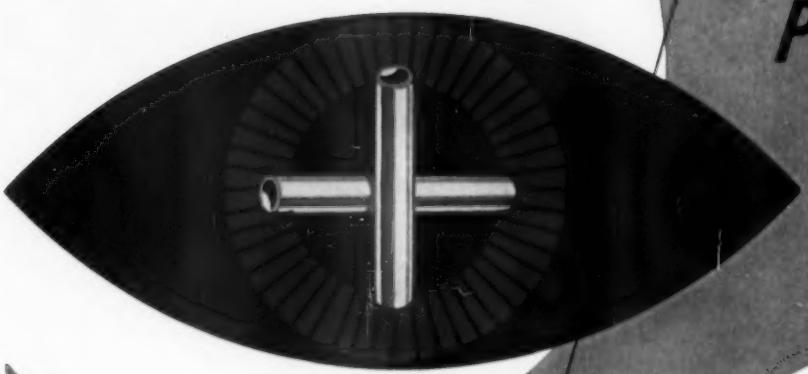
Model has a continuous rotating mandrel-carrier dial, adjustable die-holder head, and automatic unloading. Loading can be performed manually by means of a chute, or with chute and hopper feed.

Machine has a safety circuit that will stop it in the event of improperly loaded parts, either from the chute or by an operator. Speed drive is infinitely variable. Machine marks at speeds up to approximately 100 per minute.

Noble & Westbrook Mfg Co, 20 Westbrook, East Hartford 8, Conn

Booth 767

You can see the PLUS VALUES in Ostuco Performance!



You'll see SPECIAL QUALITY Tubing that lets you turn hidden costs into extra profits. Ostuco's light-weight strength values, more uniform tube walls and fine finish result in seamless and electric resistance welded steel tubing of unmatched quality.

You'll see DESIGN-ENGINEERING SERVICE go to work on your tubing problems. A wealth of design and production information is at your service. Ostuco's experience dates from the beginning of the seamless tube industry.

You'll see ON-TIME DELIVERY of tubing as promised! No costly delays that hold up your production. Ostuco has the reputation of making deliveries on schedule.

You'll see "SINGLE-SOURCE" SERVICE in action and you benefit through convenient, error-free handling of the entire order! Manufacturing and fabrication is under one roof at Ostuco—one order eliminates multiple shipments, saves time and handling costs.

Some good things our customers are saying about OSTUCO:

Agricultural Equipment: *"Your Mill is doing an excellent job with regard to maintaining delivery promises."*

Hydraulic Equipment: *"We feel partial to you because of the excellent service."*

Machine Tools: *"You are receiving 100% of the tubing we purchase and will continue to do so as long as you keep up the good quality and service."*

Drilling Equipment: *"Your tubing is the best we've ever had because of its exceptional straightness and good workmanship."*

Blue chip companies, the world over, look to Ostuco for practical solutions to their steel tubing problems. Why don't you ask one of our Tubing Engineers to show you how OSTUCO'S PERFORMANCE PLUS service turns drawing-board ideas into top quality parts faster . . . more dependably . . . with greater savings.

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OSTUCO TUBING

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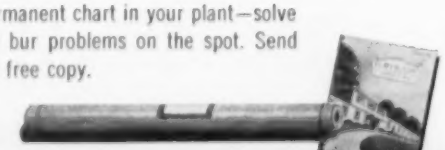

Atrax
THE ATRAX COMPANY
Newington 11, Conn.

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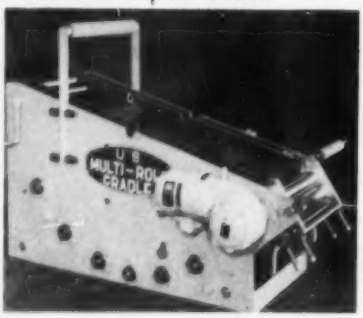


Multi-Roll Coil Cradle

Model ACC-1648 is designed to handle material up to 16 in. wide, up to 18-in. thick, OD up to 48in., weight capacity 3200 lb.

Cradle is arranged with two independently crank-adjustable inner side frames for stock width; six coil rest rolls (four power driven and two idler); one pair of power driven take-out rolls (hinged for easy loading of coils and arranged with quick-clamping arrangement for threading end of coil). Unit incorporates a microswitch loop control arrangement; time-delay relay; and 1½-hp geared motor for operation on 220/440 v, 3 phase, 60 c ac.

US Tool Co, Ampere, NJ

Booth 375

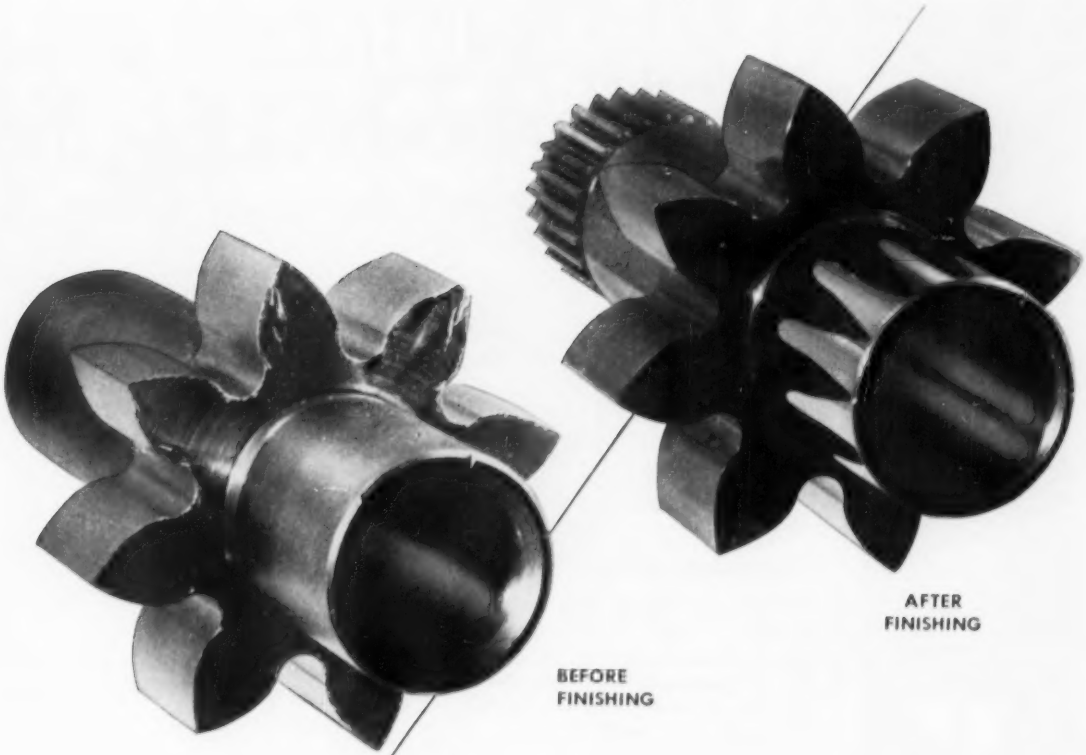
Boice Reference Master Checks Bore Gages

Adjustable reference master to check setting of bore gages can be set to any dimension between 3 and 6 in. Dimensions are obtained by stacking gage blocks, inserting them, and locking the unit at the required dimension.

Built-in centralizers position gage so that it is necessary to rock the gage only in one plane, similar to its use in the work. Features include carbide wear surfaces on the centralizers, positive lock on the movable anvil, and a guide for quick alignment.

Boice Gages, Inc, Staatsburg, NY

Booth 932



Finished to run without a . . .

drop of oil

Osborn's Brushamatic 3A is one of a complete line of Brushamatic finishing machines for semi-automatic or completely automated finishing.*
*Trade-Mark

MORE precise finishing of parts is vital to the continuing improvements in jet aircraft components. Fuel pump gears, shown above, are an example.

Unlike the original oily, kerosene-type fuels, today's jet fuel has extremely low lubricating quality. Brushing to remove burrs—blend surfaces and edges of teeth—is an important early step in producing the micro-finish that permits fuel pump gears to run at speeds to 3500 rpm, under pressures to 900 psi . . . without lubrication. Higher finishes are also reducing torque, greatly increasing equipment service life.

An **O**sborn **B**rushing **A**nalysis can point out ways to improve your finishing operations. Ask about it today. Write *The Osborn Manufacturing Company, Dept. C-43, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

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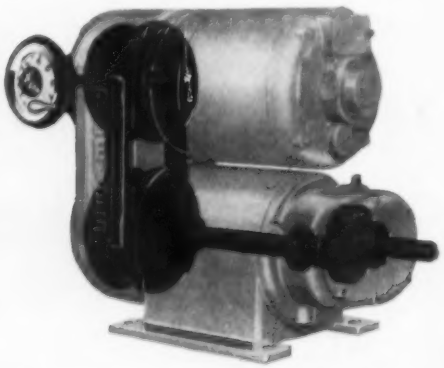
REEVES

the right speed for every need!

fractional HP Vari-Speed MOTODRIVE

compact, attractive design

Within streamlined, metallic blue housing is REEVES' "weatherized" motor, time-tested speed changing mechanism, and heat-treated helical gear speed reducer. Maximum space for vertical model only 16⅝" x 21½" x 11½". Other models equally compact.



simple, accurate operation

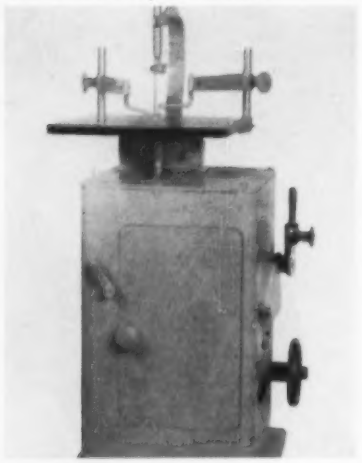
14-turn handwheel on Speedial indicator gives you stepless, accurate speeds from 3 to 4660 rpm's—within a 2:1 to 10:1 speed range. Electric remote or automatic controls also available.

versatile application

Select your *exact* needs from 112 assemblies: ¼, ½ or ¾ hp. units; horizontal left or right, vertical, or 45° left or right models; horizontal or vertical down output shaft.

Write Dept. A19b-M543 for complete bulletin.

REEVES PULLEY COMPANY • Columbus, Indiana
Division of RELIANCE Electric and Engineering Co.



Heavy-Duty Die Filer

Floor-mounted unit is designed to saw and file to the center of a 26-in. circle, provides 6-in. clearance beneath overarm.

Tilting powered arbor permits operator to work on a level table which may be tilted when processing compound angles. Speeds are adjustable from 80 to 350 spm; strokes from 0 to 5 in., in infinite variations. Overarms are power-actuated.

Rice Pump & Machine Co, Belgium, Wis **Booth 264**

Small Shop Microscope

Gaertner instrument consists of a microscope which includes a calibrated scale, each division on the scale representing 0.001 in. on the object. Instrument is held in a tripod support.

There is ample clearance to accommodate a wide variety of sizes and shapes of parts to be measured.

Gaertner Scientific Corp, 1201 Wrightwood Ave, Chicago 14, Ill **Booth 1126**

HY-PRO REVOLUTIONIZES TAP PRODUCTION WITH EXCLUSIVE 3-WAY QUALITY CONTROL

1. Heat-Treating—Hy-Pro's new heat treating installation—the industry's most advanced equipment—guarantees you the hardest, toughest taps yet achieved with unvarying perfection.

2. Electronic Analyzer—When a Hy-Pro tap is put in this machine, its structure must conform to the most rigid Hy-Pro standards—or it is electronically rejected. *All* Hy-Pro taps are subjected to electronic analysis.

Read how the Tap Specialists have raised the highest standards in the industry still higher

Now, Hy-Pro—the tap specialists and traditional leaders in tap quality—have developed a new and *exclusive* 3-way quality control. Here are the three steps:

The first is the industry's most advanced Heat-Treating installation, which guarantees you the hardest, toughest taps.

The second Hy-Pro marvel is its new Electronic Analyzer, which examines the structure of a tap without ever touching it. That's why Hy-Pro taps can produce more holes per tap at the lowest cost per tapped hole.

The third installation is Hy-Pro's new Micro-Hardness Tester. Hy-Pro taps are microscopically examined for metallurgical uniformity on both interior sections and surfaces.

And you get the benefit of these new Hy-Pro developments at no extra cost to you. Get in touch with your nearest Hy-Pro distributor, or call us direct. Hy-Pro costs no more.

3. Micro-Hardness Tester—Hy-Pro taps undergo the only known microscopic examinations of metallurgical structure on both interior sections and top surfaces. Even the extreme cutting edges are checked to within one-half of one thousandth of an inch.

REG. U.S. PAT. OFF.

HY-PRO

"The Tap Specialists"

New Bedford, Massachusetts, U. S. A.

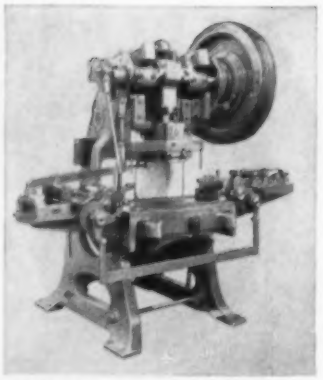
ADDITIONAL WAREHOUSES:

10428 W. McNICHOLS RD.
DETROIT 21, MICH.
UNIVERSITY 4-1077

11232 LAWLER ST. (WORTH)
CHICAGO, ILL.
GARDEN 4-0817

109 EDISON PL.
NEWARK 5, N. J.
MARKET 2-4318

Which one is best?



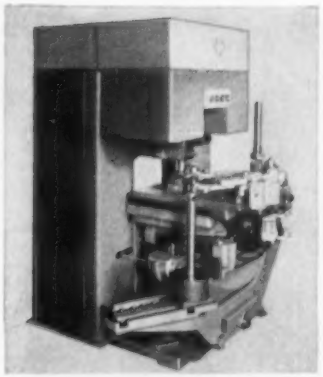
INCLINABLE . . .

Combined Experience and V&O Press Now Selecting Best Press

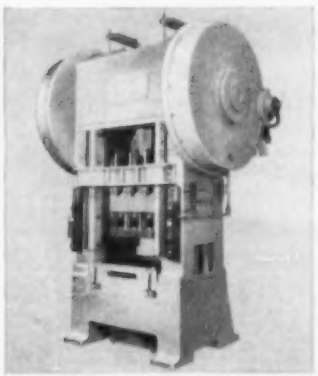
MERGER OF HENRY & WRIGHT AND V & O PRESS field sales organization means one source of information and assistance on the important basic types of mechanical presses. It means that you can count upon no-axe-to-grind counsel in appraising the basic type of unit best suited to your immediate and long range requirements.

You may be considering a press modernization or replacement program right now — and weighing the pros and cons of various press types. Whatever the end result you are seeking, it will pay you to consult the H & W — V & O representative nearest you. He will be glad to add his experience to yours in working out the best solution. *Why not write us for his name, or send for our digest of presses* to Press Divisions, Emhart Mfg. Co., 481 Windsor St., Hartford, Conn.

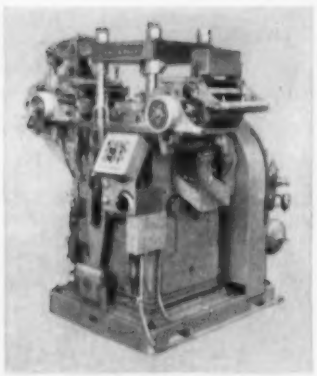
NEW AT A.S.T.E. V & O Blank Feeder and Stacking Unit for high speed notching machines. New V & O Straight Side Press . . . **BOOTH 509**



NOTCHING MACHINE . . .



STRAIGHT SIDE . . .



DIEING MACHINE . . .

# of Henry & Wright Yours to Use in for Your Needs

EMHART MFG. CO.

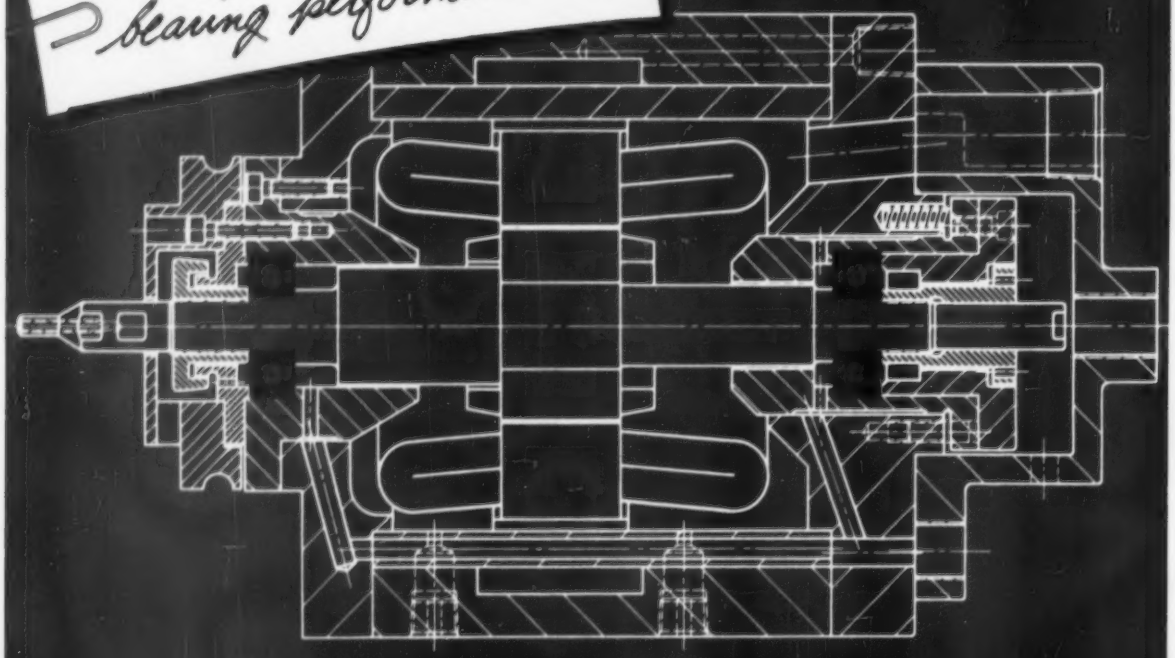
PRESS DIVISIONS

HENRY & WRIGHT
HARTFORD, CONNECTICUT

THE V & O PRESS CO.
HUDSON, NEW YORK

Presses and methods that automatically reduce costs

Looking for improved bearing performance?



over 14 billion revolutions...

– and still going strong

Fafnir Super-Precision MM201W1-CR spring-loaded ball bearing, the type specified for wheelhead illustrated.

Fafnir-equipped, high-speed, oscillating grinder wheelhead demonstrates machine tool progress in performance

This extraordinary record has been made on the production line by a Pope-built wheelhead, grinding the races of extra-precision ball bearings. The hi-frequency motorized wheelhead operates at 72,000 rpm. The motor is water-cooled and bearings lubricated by means of an oil-air mist system.

When designing this oscillating grinder wheelhead, Fafnir engineers worked together with the Pope Machinery Company engineers in the selection and application of bearings. The type of bearing recommended is shown at the left and its application in the drawing above. Its performance record, according to Pope, demonstrates progress to match today's improved machine tools.

Whatever your bearing problem, a few minutes spent with a Fafnir representative may be the means of solving it as successfully. Write The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR
BALL BEARINGS

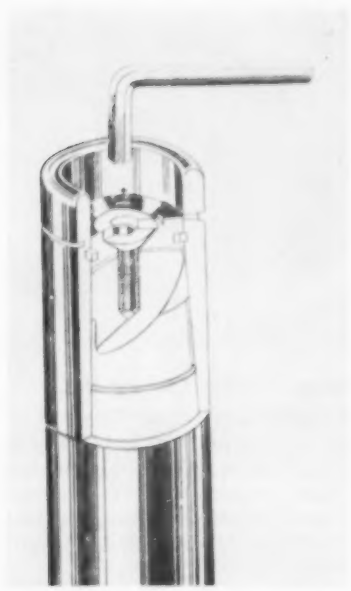
MOST COMPLETE LINE IN AMERICA

Automatic Cutoff Machine

Unit combines a fast, electro-pneumatic bar feed with power-stroked cutting head for fully automatic production cutting. Speeds of up to 1600 cuts per hr are attained, and work is turned out with a milled finish. Tolerances are reportedly held to less than 0.005 in.

Machine can be set up to cut any desired lengths up to 6 ft; cuts nonferrous metals in 2 seconds psi using steel saw blades with automatic oil-mist-spray lubrication. Cutting head is designed with geared-in-head positive drive to deliver power to cutting wheel.

Stone Machinery Co, 316 Fayette St, Manlius, NY **Booth 755**



REMOVABLE-CAP GUIDE PIN of Superior Steel Products Co is especially adaptable to die sets which have a tendency to bind when the punch holder is removed from the set—*Superior Steel Products Corp, 2754 S 19th, Milwaukee 15, Wis* **Booth 338**

W-T WALKER-TURNER

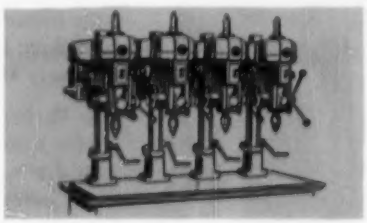
COMPARE — You'll see that you get a lot more for your money when you buy W-T "Light-Heavyweights"!

6″ Spindle travel means BIG MACHINE capacity in this 15″ Drill Press!

You don't have to go to a 20″ or larger drill press to get 6″ spindle travel. With this 15″ Walker-Turner, you can drill holes up to 6″ deep at one pass of the drill, in diameters from #60 to ½″.

This extra-capacity "LIGHT-HEAVYWEIGHT" is built to deliver fast, accurate production drilling in your plant, 24 hours a day, for a long span of years.

1300 Series — Walker-Turner "Light-Heavyweight" 15″ Drill Press — full 6″ spindle travel; six spline, full floating spindle; speeds from 480 to 5000 rpm, depending on motor and pulleys; Jacobs Chuck, or No. 1 Morse taper available. (15″



Walker-Turner "LIGHT-HEAVYWEIGHT" Drill Press with 4″ spindle travel — 1200 series — also available.)

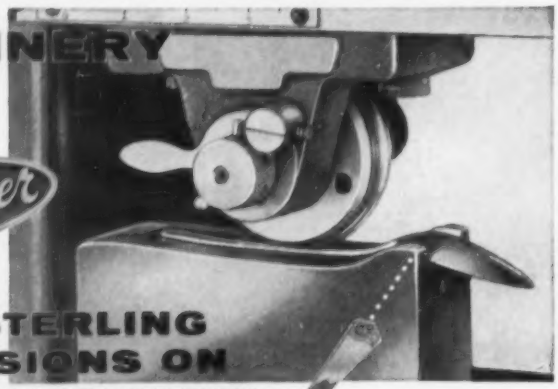
Ask your Walker-Turner Distributor to *demonstrate* the big capacity of this 15″ W-T Drill Press. He's listed under "Tools" in your phone book's Yellow Pages. Or write for his name and full specifications on these machines.

DRILL PRESSES, HAND AND POWER FEED — AIR FEED DRILL PRESS ATTACHMENT
RADIAL DRILLS — WOOD AND METAL CUTTING BAND SAWS — TILTING ARBOR SAWS
RADIAL SAWS — JIG SAWS — CUT-OFF SAWS — LATHES — SPINDLE SHAPERS
JOINTERS — BELT AND DISC SURFACERS — FLEXIBLE SHAFT MACHINES

walker-turner

WALKER-TURNER
Division
Kearney And Trecker Corporation • Plainfield, N. J.

MARKING TOOLS AND MACHINERY



by Parker

LEAVE STERLING IMPRESSIONS ON FINE SILVERWARE!

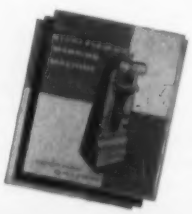
MARK INTRICATE SPOON CONTOURS WITH UNIFORMITY AND PRECISION!

Production stamping of silverware is an exacting operation. Every reject is costly! Thousands of units must be marked clearly—identically—with the last impression as legible as the first. Most blue chip companies know the importance of a quality name on a quality product; that's why they specify marking machinery and tooling by Parker.

A Parker #700 Marking Machine, tooled with a standard Parker #100 insert roll die holder and interchangeable segment type, met every requirement of precision and performance. The "cushioning" effect of the machine table, plus proper set-up, compensated for the curvature of the spoon, assuring clear, uniform production marking throughout runs in the hundreds of thousands.

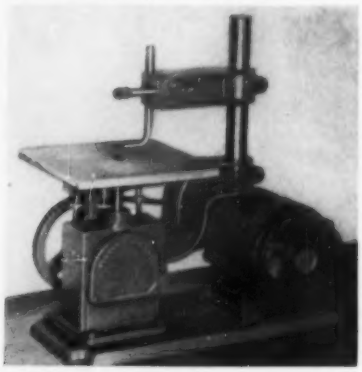
MARKING PROBLEMS?

Send today for literature on Parker Marking Machines, standard and special marking tools.



THE PARKER STAMP WORKS, INC.
MARKING DIE & MACHINERY DIV.
FRANKLIN AVENUE • HARTFORD, CONNECTICUT

by Parker



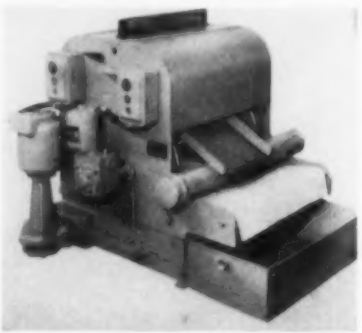
Keller Die Filer Has Self-Compensating Chuck

Die filer equipped with self-compensating chuck of wide capacity will hold files from ⅛-in. dia up to ½ x ⅝ in. File roller support has 6-in. adjustment for maximum accuracy when using long files.

Worktable area of 8½ x 8½ in. provides sufficient room for clamping guide blocks. Table tilts up to 15° in any direction.

Motor of ¼ hp runs at 1800 rpm. Two speeds of 350 and 450 strokes per minute are available. Length of stroke is 1½ in.

Sales Service Machine Tool Co, 2363 University Ave, St Paul 14, Minn
Booth 393



Barnes Coolant Cleaner Has Magnetic and Fabric Filters

Kleenall Model MP-10-16-30 combination filter has two-stage cleaning action: magnetic drum attracts and removes the major contaminant load, and fabric filtering media remove remaining foreign material.

Maker reports that use of magnetic field in first stage reduces consumption of filtering media to a minimum. Fabric is preselected according to proper porosity for required limitation of particle size.

Barnes Drill Co, 830 Chestnut St, Rockford, Ill
Booth 1127

Talking About Die Sets

with
Phil Marsilius
Vice-President
The Producto Machine Co.

"Tooling for Tomorrow"—This month's ASTE Exposition in Chicago offers you an opportunity to find out whether your tooling practices and facilities are keeping pace with the many technological advances being made throughout industry. You will be able to see the latest tooling developments on display in more than 450 exhibits.

Major die set advances have been made since the last Tool Show and many of the leading die set manufacturers will be exhibiting them at the International Amphitheatre. "Tooling for Tomorrow" includes radical changes in the design, appearance, performance and accuracy of die sets and their components; new lubrication methods; and numerous new die accessories. The Tool Show is a rare occasion for you to inspect, compare and select the developments best suited to your particular die set requirements.

Related diemaking equipment, of course, will be displayed along with thousands of other products intended to improve your manufacturing operations. The editorial pages of this magazine give you an excellent preview of some of the outstanding tools, machines, materials and processes to be demonstrated for the first time in Chicago on March 19-23.

You will also want to attend a number of the ASTE technical sessions. Such vital topics as "Plastic Tooling Challenges the Tool Engineer" and "Solving Carbide Die Problems" are on the well-balanced program. And you can choose from 12 conducted tours to plants in the Chicago area.

If you have not yet made plans to attend the ASTE Exposition, we urge you to do so. We cordially invite you to stop at Booth 396 for a personal chat about die sets.

Try Our "Blindfold Test" at the Show and See How:

PRODUCTO'S NEW DIE SET CAN ASSEMBLE ITSELF!

Yes, it's true. An ingenious guide pin design feature, new and exclusive with Producto, enables the die set to practically assemble itself. You can test it in Booth 396 at the ASTE Show in Chicago. *We guarantee you will be able to assemble the set blindfolded ...using just one hand!*

This is a real boon to the man on the bench. For him, a Producto die set means no more fussing to line up pins and bushings...no more need to hammer punch holder down on pins. He can start the punch holder on straight or at any angle...*and the die set puts itself together.* It never cocks, never jams.

While this new feature is special to a particular line of pins—available from all Producto warehouses soon after the Show—*all* Producto guide pins have been improved with greater press fit lengths, smoother end radii and mirror-like surface finish of 7-9 micro-inches.

Producto's new pins and new bushings* are added reasons you should call your nearest Producto branch for precision die sets...fast. Be sure to see these important developments in Booth 396 at the ASTE Show.

**Featured in current* Die Set Digest *with other valuable data for the diemaker and user. Write today for your free copy.*

THE PRODUCTO MACHINE COMPANY
975 Housatonic Avenue, Bridgeport 1, Connecticut
Telephone: FOrest 7-8675

For prompt die set service, 'phone these PRODUCTO assembly warehouses:

Atlanta	CY 7667	Detroit	LI 6-7600	Newark	MI 2-1773
Chicago	ES 8-3307	Kansas City	BA 9033	Philadelphia	MO 4-1010
Cleveland	SU 1-6158	Los Angeles	TR 9826	Rochester	GL 1810, GL 5357
Dayton	MU 1651	New York	WO 4-7484	St. Louis	FR 1-3370

or check Yellow Pages in any other stamping center for distributors stocking PRODUCTO.

Produce More With

PRODUCTO

Precision Die Sets

New Multi-head Abrasive-

- Now you can get this amazing new Engelberg Abrasive-Belt Grinder in 1, 2, 3, 4 — or any number of grinding heads!

- See a 4-Head Grinder at the ASTE Show — Booth No. 1221. A selection of other Engelberg Abrasive-Belt Grinders will also be demonstrated.

A COMPLETE LINE OF ABRASIVE BELT GRINDERS — ALL MADE AND SOLD BY —

ENGELBERG

Model BG8-FT9 WET-DRY SURFACER

For grinding large areas. Has automatic feed table.

Model BG8-Automat WET-DRY SURFACER

For mass production of small parts. Has built-in "conveyor".

Model 506 WET-DRY GRINDER

For quick free-hand surfacing, deburring, chamfering, rounding.

Model 648 DRY BELT GRINDER

A budget-priced 6" grinder that adjusts vertically or horizontally.

Model L4 CENTERLESS GRINDER

Handles wide range of work to tolerance of + .001 or less.

Model C6 CONTOUR GRINDER

Flexible abrasive belt runs over shaped contact roll.

Model B6W FLEXIBLE BELT

Flexible free belt grinds irregular contours.

Model WG4 PLATEN GRINDER

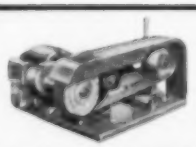
Grinds production runs of small parts to true flatness.

Model AG4 WET-DRY GRINDER

For all-around use or as low-priced auxiliary to larger machine tools.

Model B3 DRY BELT GRINDER

Used mainly for free-hand grinding and light stock removal.



Model BB5 BENCH GRINDER

Does clean-up, deburring. Removes flashings, risers, etc.

Model 305 BACKSTAND IDLER

Combines high production speed with automatic belt tension economy.

Model AB5 BACKSTAND IDLER

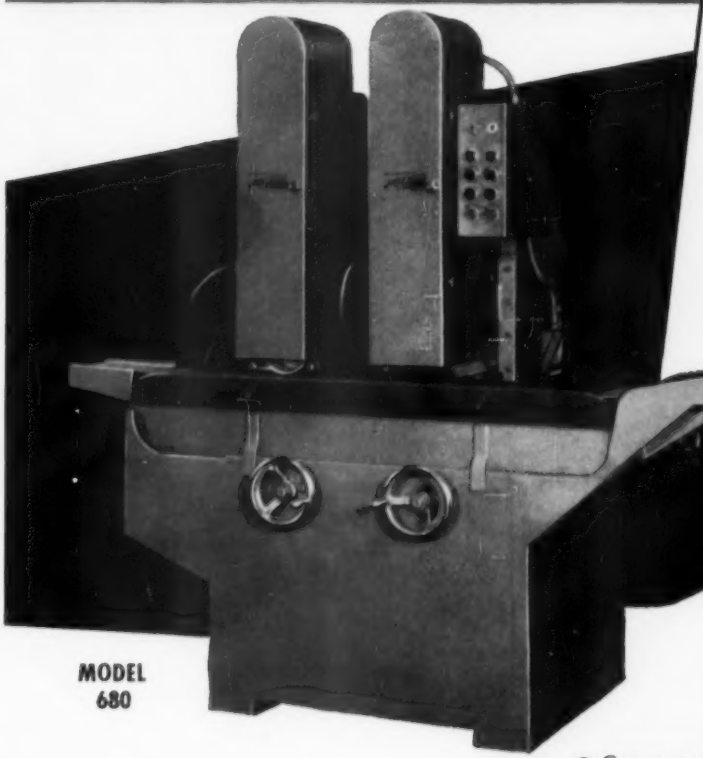
Converts grinding-polishing lathes to high output belt grinders.

Model CN2 UTILITY GRINDER

Grinds on contact wheel, platen or free belt — horizontal or vertical.

THE ENGELBERG
188 SENECA STREET,

Belt Grinder..... does Many GRINDING OPERATIONS in One Pass!



MODEL 680

GENERAL DESCRIPTION

A high-production, semi-automatic, abrasive belt machine for wet or dry grinding or polishing of ferrous or non-ferrous parts, plastics and other materials.

SPECIAL FEATURES

- Conveyor belt changed in less than 5 min.
- Conveyor belt tension adjusted by simple twist of handle
- Conveyor belt speed varied and set by quick, easy turn of a wheel
- Extra safety — machine won't start unless belt is tensioned

Easily set belt tension remains constant, can be adjusted as desired. Notice simplicity and ease of belt change.

SPECIFICATIONS

Overall Size—90" long x 51" wide x 90" high
Abrasive Belt Size—6" x 80"
Conveyor Belt Size—7" x 144"
Abrasive Belt Speed—5500 sfpm
Conveyor Belt Speed—variable from 5 to 30 fpm
Maximum Piece Capacity—4" high, 6" wide, any length

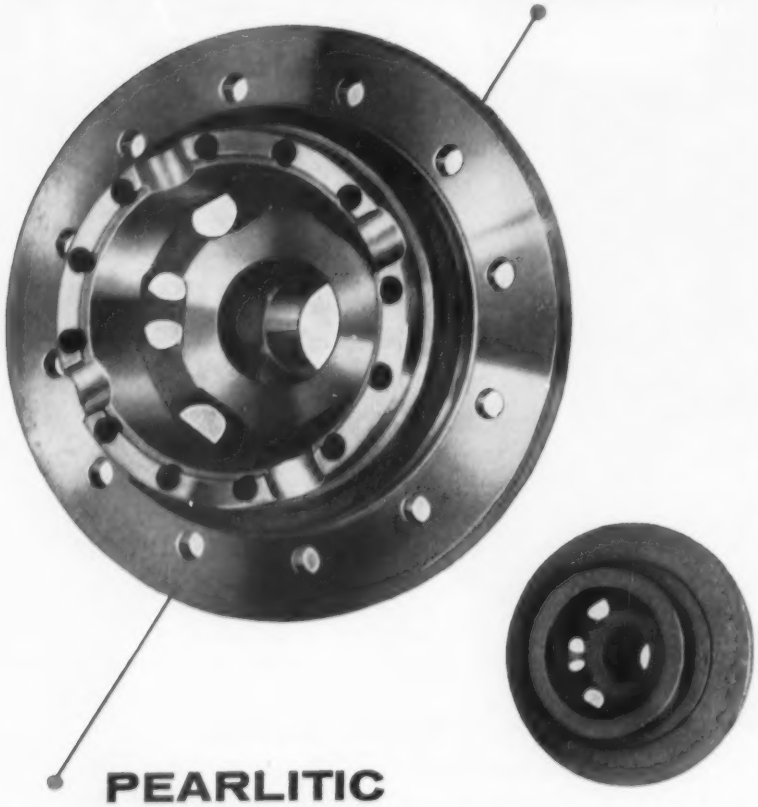
OPTIONAL ARRANGEMENTS

- Single, double or any number of heads
- 5 or 7½ hp drives
- With or without magnetic chuck

HULLER CO. Inc.
SYRACUSE, NEW YORK

Send us sample piece or print for cost—and time-savings estimate via the abrasive belt grinding way. Or ask to have one of our production engineers call to discuss your grinding problems. No charge—no obligation. Write for catalog.

MACHINABILITY INDEX 80-90*



PEARLITIC MALLEABLE CASTINGS

* B1112 STEEL = 100

Low machinability index of 80-90 (B1112 steel = 100) is probably reason enough to warrant serious consideration for your product.

But pearlitic malleable castings—from National—don't stop there. They have great ultimate strength . . . resist wear under heavy loads at high speeds . . . make excellent non-seizing bearings . . . can be air or liquid-quenched . . . can be smooth-finished.

Don't overlook the advantages of pearlitic malleable. For pearlitic malleable castings—from National—can often reduce manufacturing costs, weight and assembly time . . . can increase the sales potential of your product. AA-1806

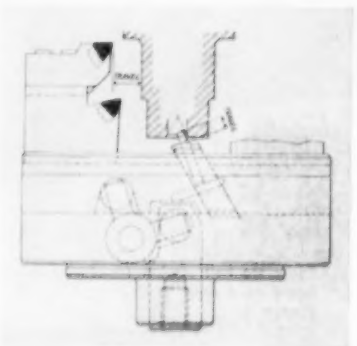
NATIONAL MALLEABLE AND STEEL CASTINGS COMPANY

Cleveland 6, Ohio

The Nation's largest independent producer of malleable and pearlitic malleable

TEMPERATURE METERS designated Temp-Chek are designed to give quick, accurate temperature readings of liquids, gases, or solids. Two meters added to existing Webber line bring temperature range of line to from -50 F to +1000 F—*Webber Gage Co, 12900 Triskett, Cleveland 11, Ohio.*

Booth 936



COMBINATION TOOL offered by Gairing hollow-mills two diameters and cross-faces a shoulder and at the same time generates a 60° included center in the end of a track roller. Cutting elements used in tool are standard ¾-in. triangular carbide inserts which are clamped with a single setscrew—*Gairing Tool Co, Detroit, Mich*

Booth 1519

Meuser Heavy-Duty Lathes Have 18 Spindle Speeds

Line of Meuser M-III-A heavy-duty center lathes features models with swing over bed of 20, 24, and 28 in. When bridge is removed, models have swing in gap of 30, 34, and 38 in. respectively. 18 spindle speeds range from 16 to 800 rpm on standard units; special models with speeds from 32 to 1600 rpm are available.

Normal feeds include 58 longitudinal from 0.0017 to 0.1320 in. and 58 cross feeds from 0.0004 to 0.0343

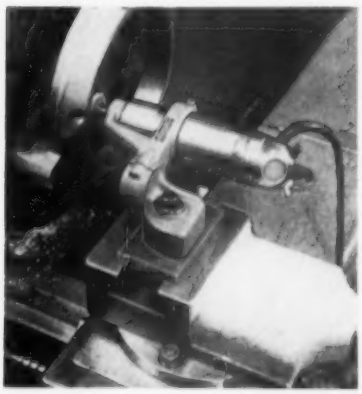
Tool Show | in Print

in. Coarse feeds include 58 longitudinal from 0.1320 to 1.0560 in. and 58 cross feeds from 0.0034 to 0.2744 in.

Quick-change gearbox gives full range of American, metric, diametral pitch, and module threads—a total of 313 different threads—without any change of gears.

A wide variety of optional accessories is available.

Barer Engineering & Machinery Co, Ltd, 1248 Notre Dame St W, Montreal 3, Canada **Booth 1424**



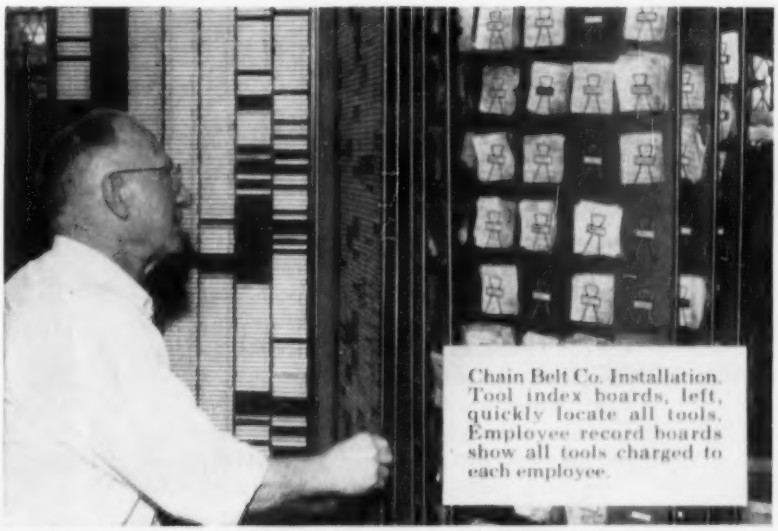
POWER QUILLS in one-piece steel housing combine high-speed motor with super accurate rigid spindle and precise collet chuck. Available with speeds up to 45,000 rpm and power outlet at chuck of over ½ hp—*Precise Products Co, 1328-30 Clark St, Racine, Wis* **Booth 296**

Component for Automatic Tapping

Features of "Tapmation" are rapid approach of tap to work, then tapping through leadscrew with locked-circuit feed and thrust control, and rapid return to start of cycle; bearing and leadscrew oil bath systems.

Standard Model No. 555 has 5-in. quill travel. Tapping capacity is up to ⅞ in. in steel under continuous duty.

Drillmation Co, 21511 John R St, Hazel Park, Mich **Booth 737**



Chain Belt Co. Installation. Tool index boards, left, quickly locate all tools. Employee record boards show all tools charged to each employee.

CHAIN BELT COMPANY OF MILWAUKEE REPORTS

"We couldn't get along without our McCaskey Tool Crib Control"

McCaskey tool accountability boards in Chain Belt Company tool crib.

Twenty years of service for Chain Belt Company of Milwaukee has proved that McCaskey Tool Crib Control is an indispensable part of any tool crib operation. Experience has shown that the small initial investment is often returned many times within the first year of use, and that annual savings can amount to thousands of dollars.

Here are just a few ways McCaskey Tool Crib Control has saved money for Chain Belt Company and will save money for you:

(1) Keeps tool inventory in the crib at a minimum, reducing monthly purchases.

(2) Prevents accumulation of idle tools at machines or benches.

(3) Reduces tool breakage by identifying source of breakage.

(4) Reduces loss and misplacement.

(5) Eliminates slow crib service, reduces non-productive time of employees and machines.

And, the McCaskey System does all this and more without additional crib personnel. McCaskey Systems are completely flexible—there is a set-up for your plant regardless of size or products. Find out how you can cut your tool expense . . . mail the coupon today.

See McCaskey Control Systems in operation at the

ASTE SHOW

BOOTH 679

McCASKEY INDUSTRIAL CONTROLS

Production • Inventory • Tools • Maintenance • Costs

Division of

VICTOR ADDING MACHINE CO.

3900 N. ROCKWELL STREET • CHICAGO 18, ILLINOIS

GALT, ONTARIO, CANADA

Manufacturers of Business Machines

Cash Registers, Business and Industrial Systems, Electronic Equipment, Electri-Cars.

Victor Adding Machine Company
McCASKEY INDUSTRIAL DIVISION, Dept. A3
3900 North Rockwell Street, Chicago 18, Ill.

Please send me your new booklet, "How Tool Costs Were Cut 12 Ways in 20 Plants."

Name _____

Position _____

Company _____

Address _____

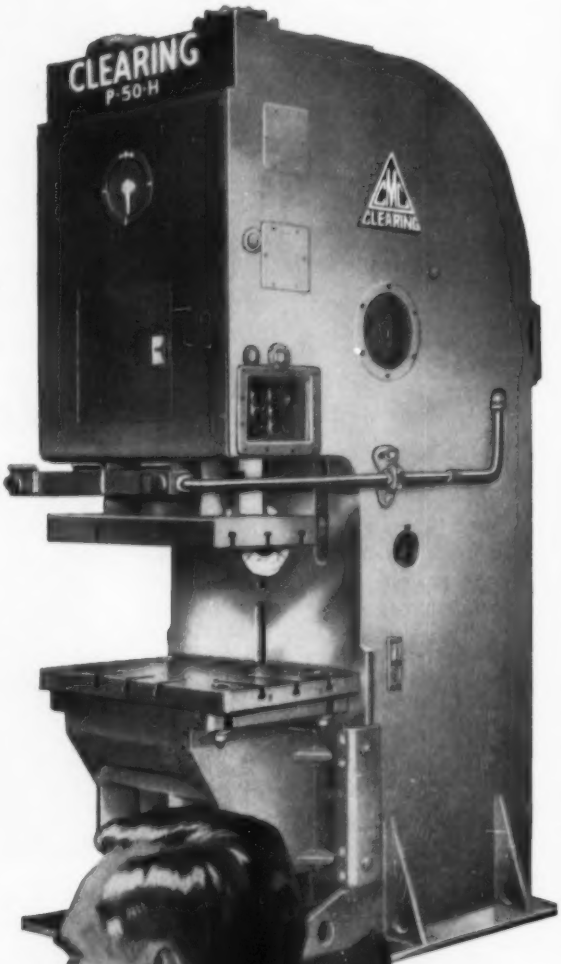
Simplify PRESS LINE LAYOUT,

BOOST PROFITS WITH THE CLEARING P-50

The Clearing P-50—a brand new idea in metalworking presses—may be able to solve some problems in your shop. First of all, the P-50 is designed for complete versatility. It can do practically any job in its capacity range. Its adjustable table will provide the right die space for both high and low dies. Remove the table completely for horn press operations.

Put it anywhere in your press line to perform follow-up operations or tool it up for a long run blanking or forming job. The P-50 is built to give top production in either spot.

The P-50 is designed for simple portability and installation. Its enclosed design means that if it will fit into a spot it can be operated there. Gearing and flywheel are built into the frame; so are controls and die space lighting. Simply connect your air line and power; the P-50 is ready to go. If your production setup can use a utility press the P-50 will pay for itself in convenience and time saved. Find out more about it. Write or call Clearing for more information.



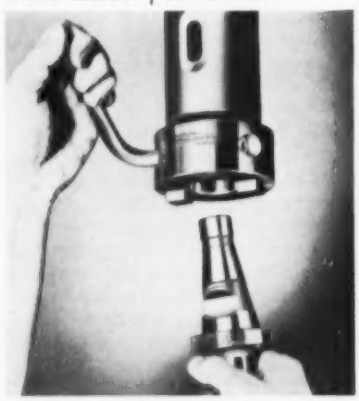
This completely self-contained P-50 features fully enclosed design and built-in controls. This speedy machine (single strokes at 80% of rated strokes per minute) can be moved anywhere in the shop and put into operation in a matter of minutes.

Write for Clearing brochure, "Thinking about a better way to do the job?"

CLEARING PRESSES THE WAY TO EFFICIENT MASS PRODUCTION

CLEARING MACHINE CORPORATION *Division of U. S. INDUSTRIES, Inc.*

6499 W. 65th Street, Chicago 38, Illinois • Hamilton Plant, Hamilton, Ohio



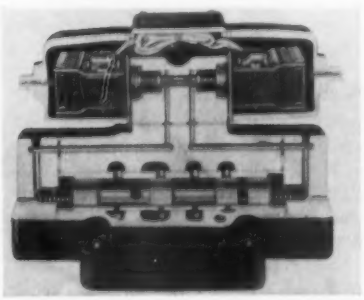
DeVlieg Toolholder

Flash-Change is designation for toolholder designed to provide maximum rigidity for all types of drilling, boring, and milling operations. Boring bars and adapters are located radially in the toolholders by means of driving keys, thus insuring positive repositioning of tools.

Tools reportedly can be changed in a matter of seconds.

DeVlieg Microbore Co, 2720 W Fourteen Mile Rd, Royal Oak, Mich

Booth 421



Double Solenoid D-Way Valve

Racine ¾-in. balanced piston, sleeve-type unit is designed to withstand 2000 psi, allows full back pressure on exhaust port. Capacity is 20 gpm.

Balanced piston eliminates thrust, provides positive operation. Throttled reversal is obtained through round holes in sleeve. Valve operates with 50-psi pilot pressure. Series conforms to JIC specifications.

Racine Hydraulics & Machinery, Inc, Racine, Wis

Booth 229

Hacksaw Blades

Three types of power and hand hacksaw blades, each with special characteristics to permit a wide range of cutting applications, are color-identified for fast selection:

"Redstripe" SM special alloy high-speed steel power and hand blades

DRILL PRECISION HOLES

Whether you drill deep or shallow, vertical or horizontal . . . your drill press or lathe will give you *in one pass*, a true-round, straight hole with location and concentricity . . . AND YOU'LL SAVE MONEY!

HERE'S HOW: —

Use the accepted precision Gun Drill method

- Gun Drills eliminate boring, honing and reaming.
- Gun Drills operate at higher RPM, lower feeds giving you greater tool life, better wall finish.
- Gun Drills permit the use of multiple drilling and quick-loading fixtures . . . even automation.

Use SEALOL'S *easy-to-install* FLUIDRILL ADAPTER

- Fluidrill Adapters transfer coolants at high rotational speeds to 10,000 RPM . . . at pressures to 1000 psi.
- Fluidrill Adapters eliminate hot drilling and slow chip removal problems.
- Fluidrill Adapters improve quality of holes, give you fewer rejects and greater output.

Look at these savings from case histories on file:

- "Time of production reduced 500%"
- "Tolerance held to less than .0005 in."
- "Finishes held to 8 - 10 RMS"
- "Operations reduced 4 to 1"

FOR IMPROVED DRILLING PERFORMANCE *in your* shop, find out more about PRECISION GUN DRILLING with Sealol's FLUIDRILL ADAPTER today.

SEALOL

MAIL THIS COUPON TODAY

DEPT. G, WARWICK INDUSTRIAL PARK, PROVIDENCE 5, R. I.

Please send me Bulletin information on *precision* gun drilling with Sealol's FLUIDRILL ADAPTERS.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

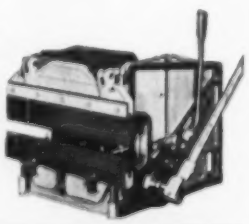
CITY _____ ZONE _____ STATE _____

STROKE CONTROL means that you set the most practical length of stroke for each job—60 strokes per minute at ¼" stroke, 24 strokes per minute at 1½" stroke. The cam shaft does not make a full revolution as is true with flywheel driven press brakes.

Regardless of length of stroke used, *the ram speed is always constant* to insure safe, smooth, efficient operation. No violent whipping action of material.

Twelve tons of smooth hydraulic power is applied through a mechanical cam drive which assures perfect, positive alignment of bed. Ram can be "inched" or immediately backed-off. Capacity is 16 gauge steel across 36" bed. Wide variety of standard dies in stock.

For short run or experimental work use the Di-Acro hand operated Press Brake. Eight tons of power forms 16 gauge steel across the 24" bed. Uses standard dies.



Write for Press Brake literature
pronounced die-ack-ro

di-acro PRECISION METALWORKING MACHINES

O'NEIL-IRWIN MANUFACTURING CO.
405 8th AVENUE, LAKE CITY, MINN.

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are tempered for extra toughness and high-speed cutting of hard materials with heavier speeds and feeds.

"Greenstripe Safeflex" welded-edge power blades and hard-edge flexible back hand blades are double-welded to make them shatterproof and long lasting in cutting of tough alloy steels, multiple cutting, or interrupted cuts. Hard cutting edges and flexible back are claimed to make them almost unbreakable.

"Bluestripe" high-speed steel power and hand blades are heat-treated for high-speed production sawing of hard-to-cut metals like high alloy steel, stainless, phosphor bronze, tool steel, rails, chrome steel, etc.

L S Starrett Co, Athol, Mass **Booth 1116**

Redesigned Master Bushings

Design features include new standards for relief, said to give greater bearing surfaces and improve accuracy; ground shoulders which seat bushings square to punch holder for perfect alignment; ground lead on press fit which starts bushing into punch holder easily; double figure-8 oil grooves, fed by grease fitting, to provide constant lubrication to pin and bushing; tumble-blasting of all unground surfaces.

Producto guide pins have also been improved with greater press fit lengths, smoother end radii, and surface finish of 7-9 mu in.

Producto Machine Co, 990 Housatonic Ave, Bridgeport 1, Conn **Booth 396**

Automatic Blank Feeder, Stacker

V & O automatic blank feeder and stacking unit is designed to be used with V & O Model 410 notching machine. Unit automatically transfers rotor or combination rotor and stator blanks from an oriented stack to the notching fixture. It positions blank on the spindle, removes notched blank, and then stacks it. Feeding and stacking time, exclusive of notching operation, is approxi-

mately 1½ seconds with the feeder.

Unit will accommodate blanks 4 to 13 in. in diameter. Second unit now in final stages of development is designed to handle blanks 10 to 30 in. in diameter.

Blanks without a keyway are oriented by the slot only. Blanks with a keyway or driving hole are oriented by either keyway or driving hole.

V & O Press Co, Hudson, NY

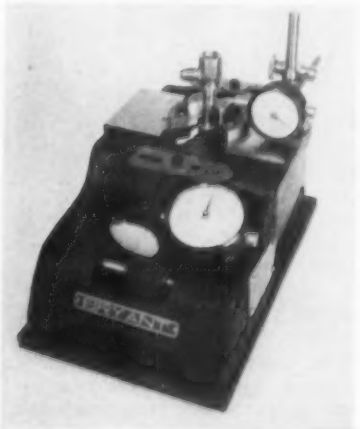
Booth 509

Safe-T-Hammers

Tools are designed for striking a hard blow without injuring delicately machined surfaces. Hammer head is copper or copper alloy which will flatten, but not fracture or chip. It is molded on the end of a lightweight, tubular steel handle, crimped and given a butterfly twist to eliminate use of wedges and to prevent head from loosening or coming off.

Units are stocked in fifteen sizes from ⅛-lb hammers to 15-lb sledges.

Univertical Machine Co, 14841 Meyers Rd, Detroit 27, Mich **Booth 202**



BRYANT B-21 BENCH GAGE checks internal and external threads. Model is shown with attachment for checking concentricity. Attaching for checking squareness of face in relation to a thread is also available—*Bryant Chucking Grinder Co, Springfield, Vt*

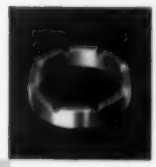
Booth 901

a new expanded field of

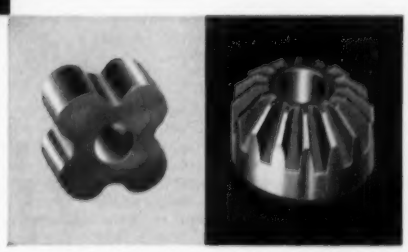
BEARING DESIGN and APPLICATION

The inauguration of Bunting's new facility for engineering and manufacturing bearings and parts of Sintered Powdered Metals opens a wide new area of opportunity to all mechanical industry.

Sintered Powdered Metal Bearings and parts offer real economies in design. Bunting Engineering and manufacturing skill and traditional technical responsibility assure your most advantageous use of this material.



A competent group of Bunting Sales Engineers in the field and a soundly established Product Engineering Department put at your command, comprehensive data and facts based on wide experience in the designing and use of Cast Bronze and Sintered Powdered Metal Bearings and parts.



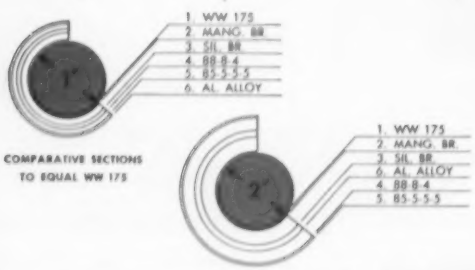
Write to our Product Engineering Department in Toledo, or consult our nearest Sales Engineer.

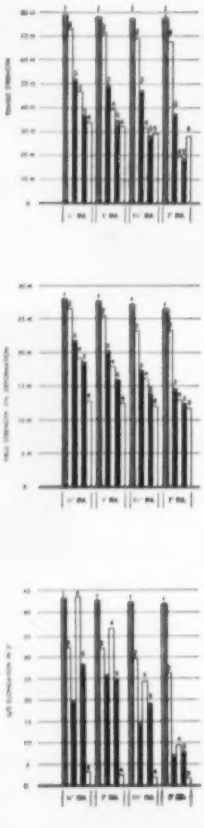
Bunting®

BUSHINGS, BEARINGS, BARS AND SPECIAL PARTS OF CAST BRONZE AND POWDERED METAL

The Bunting Brass and Bronze Company • Toledo 1, Ohio • Branches in Principal Cities

and put the SURPLUS *in your pocket*





The two diagrams above show relative sections cast nonferrous alloys required to *equal* the tensile strength of 1" and 2" dia. WW 175 Aluminum Bronze. Note how tensile strengths fall off as sections increase—except when you design with WW 175, the *constant* alloy! The comparison becomes even more dramatic when you study the bar charts showing tensile and yield strengths and elongation. Regardless of section required, WW 175 retains these mechanical values with only a minor decrease.

What does this mean? You can design smaller sections requiring less metal (a saving even when WW 175 is compared to many cheaper alloys), you reduce the mass, you save weight—so you cut the cost of your product while improving its performance. Don't forget, too, that WW 175 at .274 per cu. in. weighs substantially less than most competitive bronze alloys.

Want to know more about the big family of WW Aluminum Bronze Alloys? Our new catalog gives full details, specifications, properties, applications of 16 types, comparative specs, machining recommendations and information on our foundry and production facilities. Write for No. 15,100-1 and name of our representative in your area.

WW ALLOYS, INC.
11652 CLOVERDALE AVE.
DETROIT 4, MICHIGAN
Division of Fansteel Metallurgical Corporation

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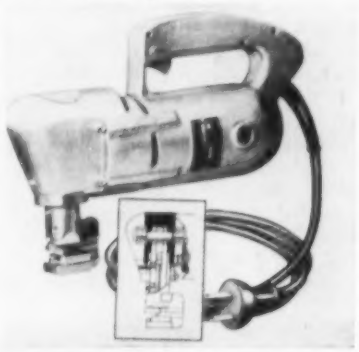
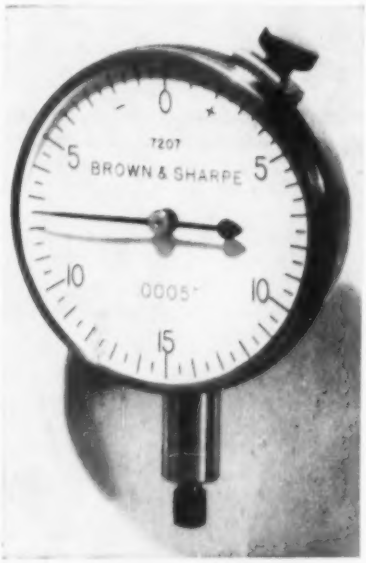


Portable Nibbler Cuts 10-Gage Stainless

Fenway Model HN heavy-duty nibbler is portable machine which reportedly can cut 10-gage stainless or 8-gage mild steel. Machine has a minimum cutting radius of 6 in. Cutting speed is 50 ipm.

Over-all length of 13-lb nibbler is 13½ in. Device is driven by a 1-hp universal-type motor which operates on ac or dc. Lightweight frame is of cast aluminum.

Fenway Machine Co, 263 N 23rd, Philadelphia 3, Penna **Booth 937**

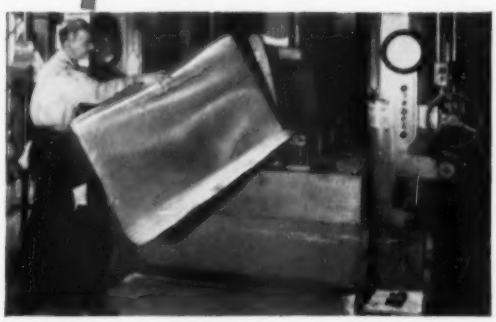


DIAL GAGES are available in expanded line of 47 styles and sizes, including units with plain and jeweled bearings, and shockless types—*Brown & Sharpe Mfg Co, Providence 1, RI* **Booth 374**

Through-Broached Socket Screw

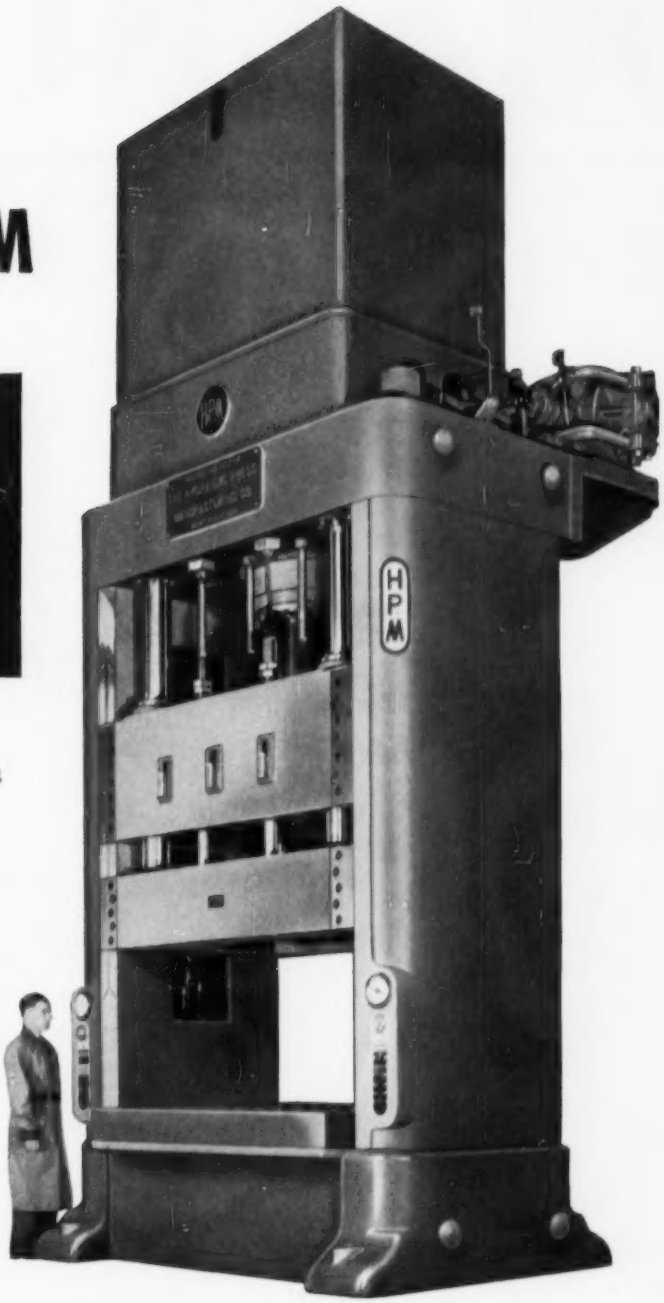
Bristol version of socket set screw features socket extending full length of screw. Screw is available in sizes ranging from No. 4 wire size

Ingenious Tooling– versatile H-P-M



Convair Adapts Standard H-P-M 1000 Ton For Stretch Forming

Here's proof of the unlimited versatility of H-P-M hydraulics. In this unusual application, Convair Division of General Dynamics Corp. of San Diego, use an H-P-M all-hydraulic 1000 ton double action press for stretch forming aluminum Convair-Liner dorsal fins. The accurately controlled hydraulic pressure of the H-P-M press throughout drawing and clamping action assures proper metal forming over a plastic die. Equipped with the time-proved H-P-M FAST-RAVERSE Closed Circuit hydraulic system, dependable H-P-Ms offer the solution for most tough metalworking problems. Nearly 80 years of experience stand behind thousands of these H-P-M presses now in production all over the world. Call in a nearby H-P-M engineer at the planning stage. He may be able to save you real money.



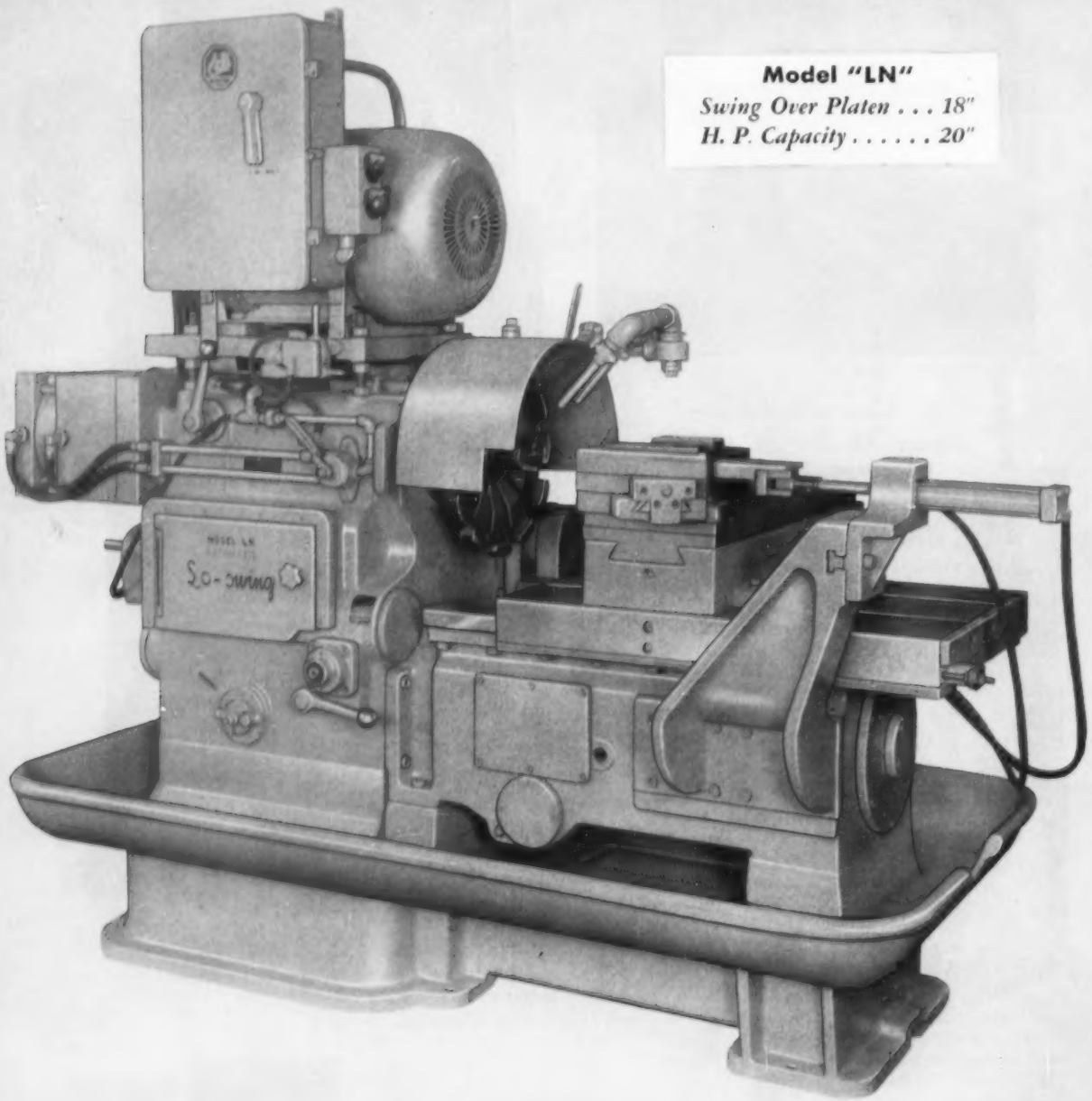
H-P-M all-hydraulic 1000-ton FASTRAVERSE sheet metal drawing press equipped with a 400-ton blankholder and 250-ton die cushion.

METAL WORKING DIVISION
THE HYDRAULIC PRESS MFG. CO.
Mount Gilead, Ohio, U.S.A.

HPM

MACHINE OF

PREPARED BY THE SENECA FALLS MACHINE CO. "THE So-swing PEOPLE" SENECA FALLS, NEW YORK



Model "LN"
Swing Over Platen . . . 18"
H. P. Capacity . . . . . 20"

SENECA FALLS PLATEN-TYPE,

THE MONTH

NEW PLATEN-TYPE AUTOMATIC LATHES CUT BORING, FACING AND TURNING COSTS

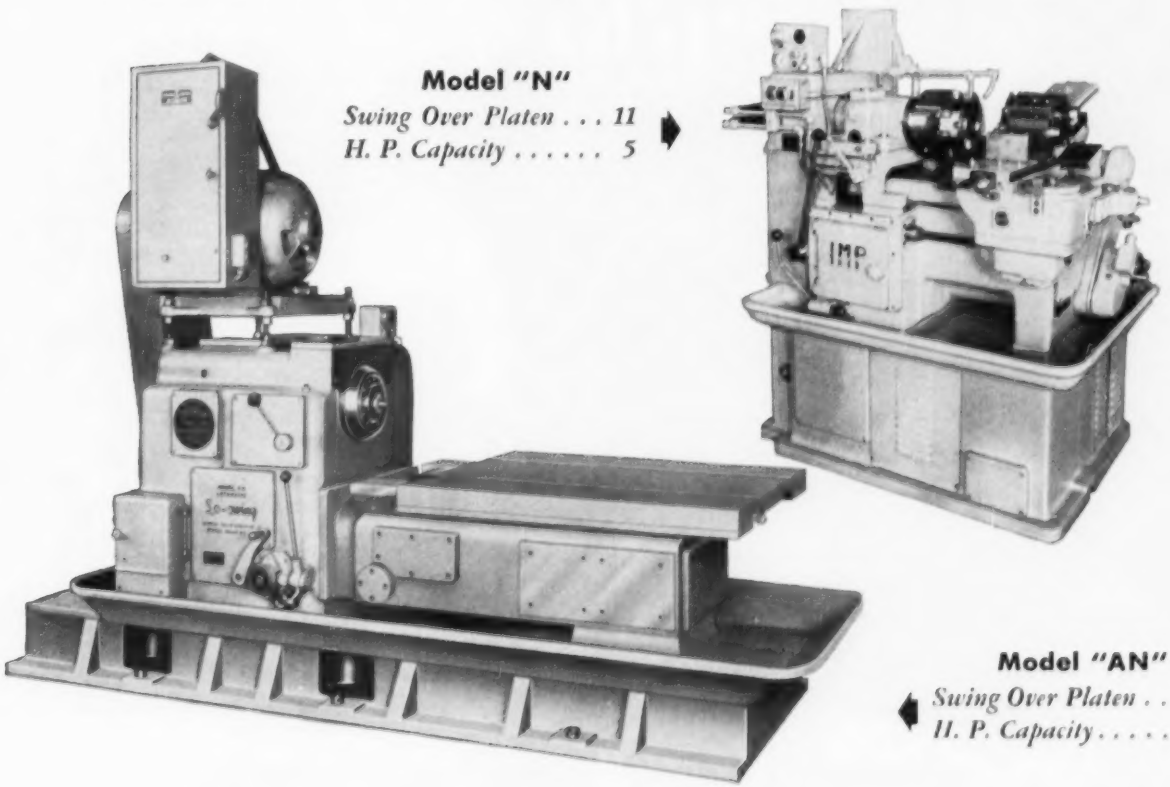
The NEW Seneca Falls Platen-Type Automatic Lathes have been designed principally as chucking machines adaptable to a wide variety of work requiring large swing capacity, high spindle speeds, multiple tooling and fast cycling operation.

The platens have cam operated longitudinal and cross feeds and may be equipped with angular feeding slides and other special attachments suitable for customer's work.

All three types of machines may be equipped with Seneca Falls Automatic Loading and Transfer Equipment which provides means to extend automaticity to individual machines or through a series of successive, though dissimilar, operations to combine work loading, machining and work transfer into one single, automatically controlled phase of production flow.

Seneca Falls production-minded engineers are at your disposal to solve your chucking problems.

Write for Bulletin N-A



Model "N"
Swing Over Platen . . . 11
H. P. Capacity 5

Model "AN"
Swing Over Platen . . . 24"
H. P. Capacity . . . . . 40"

CAM-OPERATED AUTOMATIC LATHES

Here are the points...
Jaws Nickel Chrome Moly Alloy Steel
Key Holes: do not extend into body cavity thereby sealing out dirt
One Piece Geared Nut Construction
Entire Chuck Body Hardened inside and out
Taper Bore hardened and ground
Chucks and Keys interchangeable with other makes
...that make
Quality
Supreme
BRAND
Chucks
Every chuck is individually checked for accuracy . . . you can depend on Supreme Chucks for trouble-free performance and long wear.
SUPREME CHUCK
SUPREME PRODUCTS, INC.
2222 S. CALUMET AVE., CHICAGO, ILLINOIS
the chuck that lives up to its name . . . SUPREME

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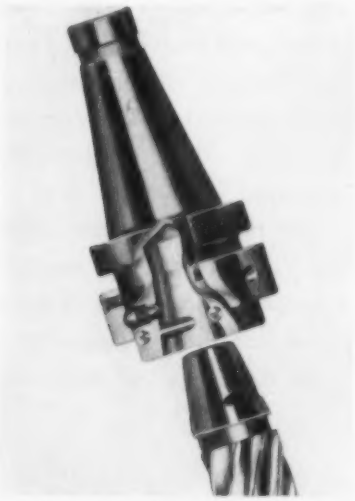
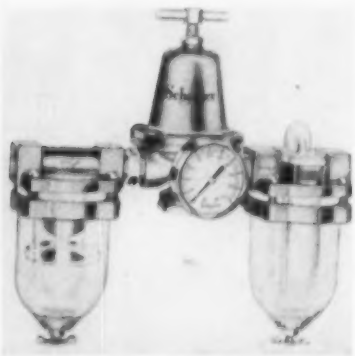
to 1-in. diameter in suitable lengths, and in either hex or multiple-spline socket.

Through-broached socket is symmetrical, so that screw can be wrenched from either end. No grinding or modifications are necessary for use with power screwdrivers. Device can be used either as set screw or as locking ring.

Bristol Co, Socket Screw Div, Waterbury 20, Conn **Booth 541**



TOOLHOLDER AND ADAPTER called Kwiklok is designed for receiving and driving standard and special shank-type tools. Manufacturer stresses quickness in changing tools—*Falcon Tool Co, Box 4605 Detroit 34, Mich* **Booth 812**



Filter-Regulator-Lubricator

Lub-air-ator for airlines serving controls, instruments, or air tools performs triple duty.

Filter cleans air as it moves through; air is regulated to proper pressure requirements; and lubrication in correct amounts is delivered. Inlet pressures up to 250 psi can be regulated down to 5 to 125 psi by

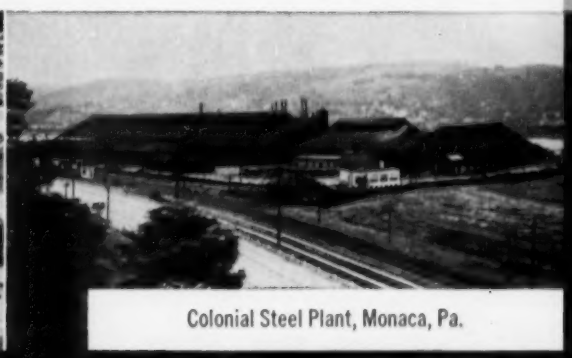
Vanadium-Alloys Steel Company

world's largest exclusive manufacturer of Tool Steels

—the capacity, the facilities, the skill and the will to serve you better!

Five manufacturing plants in the U.S. and Canada, twelve branch offices, well-stocked warehouses, a network of distributors in the major metal-working areas and individualized truck delivery provide the measure of our service ability. The First Quality of our tool steels is assured by complete specialization in manufacture and an unremitting concentration upon perfection, every working day in the year.

Vanadium-Alloys Plant, Latrobe, Pa.



Colonial Steel Plant, Monaca, Pa.

Anchor Drawn Steel Plant, Latrobe, Pa.

Hot Rolled Products from mills up to 22" diameter—Cold Drawn Products—Precision Ground Products—Plate—Sheet Circles—Forgings. Standard and Special Shapes in High Speed, Die Steel and Special Tool Steel Compositions.

Pittsburgh Tool Steel Wire Plant, Monaca, Pa.

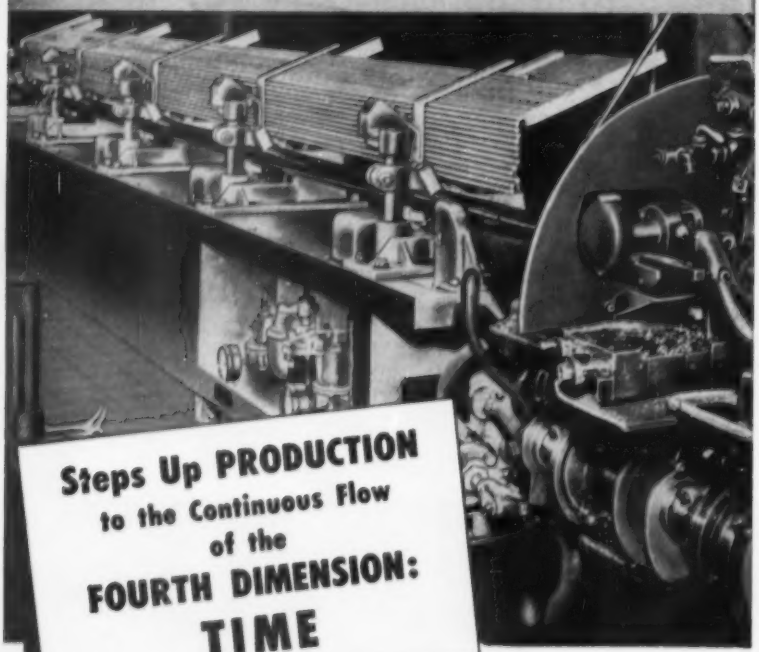
Vanadium-Alloys Steel Canada Limited, London, Ont.

Vanadium-Alloys Steel Company

Latrobe, Pennsylvania

Subsidiaries: Colonial Steel Co. • Anchor Drawn Steel Co. • Pittsburgh Tool Steel Wire Co. • Vanadium-Alloys Steel Canada Limited • Vanadium-Alloys Steel Societa Italiana Per Azioni

Now... A Screw-Machine-Feed that BREAKS THE TIME BARRIER!



Steps Up PRODUCTION to the Continuous Flow of the FOURTH DIMENSION: TIME

EVERY TIME a screw machine cuts air... every time feed fingers are adjusted or replaced... every time remnant removal forces a shut-down — *that's time lost forever, never again to be made up in the production quota!*

In the modern Lipe Automatic Magazine-Loading Bar Feed, we present a continuous-feed mechanism that utilizes *every minute* of the working day for production...and still more production.

There's *No* cutting air. *No* feed fingers. *No* remnant problem. *No* minimum or maximum run. *No* limit on length of feed. *No* selective stock length requirement.

There IS a definite increase in production — up to 100% on some installations — *at least* 30% on *every one!*

Send today for FREE BOOKLET giving full details on Lipe's AML Bar Feed — today's big advancement in screw machine stock feeding. We will also supply name of your nearest distributor.

Lipe-ROLLWAY CORPORATION
Manufacturers of Automotive Clutches and Machine Tools
Syracuse 1, N. Y.

Tool Show | in Print

turning regulator handle. Equipment is designed for working pressure up to 150 psi.

A Schrader's Son, 470 Vanderbilt Ave, Brooklyn 38, NY **Booth 525**

Dial Indicator Set

Compact kit contains set of three high-precision, low-friction dial indicators: a No. 25-111 graduated 0.0001 in., reading 0-5-0, range 0.025 in.; a No. 25-131 graduated 0.0005 in., reading 0-25-0, range 0.125 in.; and a No. 25-441 graduated 0.001 in., reading 0-100, range 1.000 in. Set comes in a mahogany case with no-glare satin chrome finish, is designed for applications where heavy investment is not justified.

L S Starrett Co, Athol, Mass **Booth 1116**

Punches and Die Buttons For Sheet Metal Fasteners

Five-station progressive die using standard RB punches and die buttons produces in sheet metal the means for utilizing three different fastening methods: thread-hole forming for types A & B sheet metal screws; special contour hole for Simmons-type spring-lock fastener; and round clinch nut inserted and surrounding metal embossed.

Richard Brothers Punch Div, Allied Products Corp, 26500 Capitol Ave, Detroit 39, Mich **Booth 478**

Hole-Deburring Tool

BurrAway, in sizes from 1/8 to 1-in.-dia, has a HSS cutter blade that turns at 50 to 75 sfm, depending on material being processed. As tool is passed through a hole, blade first cuts, collapses, then cuts again on the return stroke, automatically removing burrs both on top and underneath, without turning the work.

Cogsdill Tool Products, Inc, Oak Park, Mich **Booth 185**

Dial Snap Gage

Nilsson dial snap gage has locking device which permits adjustable anvil to travel one inch without losing its parallel. Anvil is locked on both outer ends of the bearing surfaces simultaneously. No wrenches are needed to operate locking mechanism.

Because parallelism is maintained, range on snap gages is increased one inch without losing accuracy the gage had before.

Nilsson Gage Co, Inc, 255 Mansion St, Poughkeepsie, NY **Booth 717**

"Standardize" on

IDEAL

LIVE CENTERS

Get the LIVE CENTERS You Need – When You Need Them – FROM STOCK

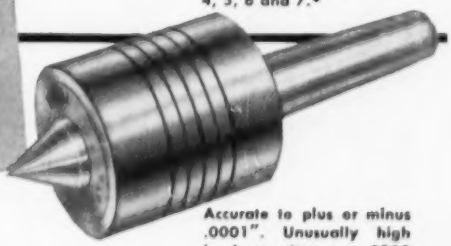
See Your IDEAL Distributor!

MULTI-DUTY

Interchangeable male, female and pipe points for centered and uncentered work. Nine sizes; Morse tapers 1 through 5, as well as straight.* Loads to 1500 lbs. at 100 RPM.

HEAVY DUTY

For your BIG jobs! For close tolerance turning on work up to 22,000 lbs. at 50 RPM. Eccentricity of less than .0002". Morse tapers 4, 5, 6 and 7.*



UNIVERSAL

Accurate to plus or minus .0001". Unusually high load capacity up to 5200 lbs. at 50 RPM means better work on a wider range of jobs. Morse tapers 2, 3, 4 and 5.*

NEW PIPE POINT LIVE CENTER

For heavy turning work on pipes and other large, hollow cylinders. Sizes range from 3" diam. to 7½" diam. Load capacities up to 22,000 lbs. Morse tapers 3, 4, 5, 6 and 7.*

The Complete Line of Live Centers
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ROUND TABLE *Discussion*

ABOVE REPROACH?

Has a foreman lost the respect of his men if they feel free enough to kid him about something that happened outside the shop? Is this a sign of undue familiarity that should not be tolerated?

A FOREMAN, of course, must set a good example to his men to keep their respect and loyalty but this does not mean he should go to the extremes of the Victorian era. It does mean, however, that he must be dependable, keep his word, be punctual, advise and help his men, and see to it that the shop operates on a strictly business-like basis with no horseplay, crude acting, or time-wasting visiting around the plant. Al is right by taking a serious view of a foreman's responsibilities, for a machine shop is not the place for jokes and some of the so-called fun.

The best foreman I ever observed (let's call him William Jessop) did not seem to be a foreman at all. Bill was quiet-spoken, but always came straight to the important matter he wanted to discuss, and he knew machine-shop production and costs in all the details. A fast-running lathe with a fine feed and slim cut on a roughing-out start did not prove to him that the operator was a fast worker and he did not hesitate to say so. On his next trip through the shop he would check to see that a

"Sorry to see you leave the company, L. C., we boys hate to have to break in a new shop foreman."

hogging cut was in operation. The drillers knew that two corkscrew chips should be coming out of the hole being drilled or Bill would want to know the reason why. But in spite of Bill's strict all-business-and-production attitude, he probably was the best-liked guy in the shop. In some inexplainable manner Bill inspired confidence in his men and they would seek his advice on financial, domestic, and other problems that affected their private lives, as well as the best way to tackle a new job.

When a new man started in the shop it was Bill who took him around and got him comfortably acquainted with the fellows he would come in contact with; after that he would be properly started on his first job. All the time Bill would be quietly watching to discover if the new man really knew how to go about setting the work properly, securely clamping in position without springing or distortion, and the selection of the proper tools, speeds and cuts. If the man made any mistake Bill would act as though it was a matter of unfamiliarity with the new machine or over-cautiousness and thus steer him in the right direction.

After hours, and away from the shop, Bill was one of the gang. At the annual picnic Bill really enjoyed himself; he called everyone by his first name and everyone called him Bill, even the wives, kids, and the single men's girl friends soon joined in. In other words, Bill was human and one of the gang.

The fellows knew that when Bill found it necessary to severely criticize some error that had been made, they somehow felt that they really deserved the few sharp words Bill said about their carelessness, lack of a clear idea of what they were attempting to do, or just plain ignorance of knowledge they should have of the proper way to do the work.

In contrast to Bill, was a stern foreman I once knew (let's call him Howard) who took the attitude that every man in his department must be criticized at frequent intervals to keep him "in step," whatever that meant, and no one ever received a pat on the back for, Howard said, "First class work is expected, and anything less is just sloppy carelessness." Howard never cussed, never drank, never smoked, never attended shop picnics, and if ever a man was above reproach it was Howard. But he was not a successful foreman; he could not keep costs under control, his delivery promises were not to be depended upon, his personnel turn-

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over was much too high, as well as very expensive, and after a year he was fired.

Just being "above reproach" is not the answer to the management's demands, for it is simply one item. No successful firm expects to assemble department heads that are perfect in everything—they are satisfied to find experienced men who rate fairly high in all their requirements. The Bill Jessop type is very satisfactory.

George P Pearce
Albuquerque, NM

So NELSON took a blonde home the other night and Al thinks the other foremen ought to talk to him, warn him how dangerous it is to be seen with a blonde.

Phooey! But that isn't the reason for my objections to Al's criticism of Nelson. With women playing an important part in industry, relationships are much more normal than ever before. But the main fault with Al's criticism is decidedly open to criticism itself. Just what does Al mean by getting "too familiar with the boss?"

I've known foremen who insisted that the men call them "Mr." But they were seldom the best foremen. Just what is dignity in the shop between foremen and their men? Do Al's men call him Mr or just Al? Having his men call him by his given name does not of itself denote lack of respect for his ability or his authority. During the war I spent several weeks in the Disney Studios regarding films they were making for the Navy. I heard no one call Disney "Mr." He was Walt to everyone, and he loved it. Needless to say, he has been a fairly successful boss.

The best boss is the one who gets

"Work here is very interesting—so many changes—no one knows what the finished job will look like."

the work out of his department on time, his men all working to keep production up to quality. The men consult him and make suggestions when they have an idea that they think may help. He gives the men full credit when they come up with a good idea, whether they put it in the suggestion box or not. Incidentally, suggestion boxes came into use largely to prevent foremen from claiming ideas originating with their men.

Men respect foremen who know their job and who are fair in assigning work as well as in the treatment of their men. A few may prefer to call the foreman Mr, but they are the exception. A foreman who knows his job and his men can take a joke —about a blonde or anything else— without losing face with his men. Men can spot false dignity a mile away. I've known a few good foremen who insisted on being Mr'd, but it did not add to their effectiveness or their happiness. They lost something that comes from close companionship.

If it comes Al's turn to take the blonde home some night, he ought to be glad if the men like him well enough, and feel free to kid him about it. They will think him a lot more human than if he acts as though he thought he was made of a special brand of clay.

Fred H Colvin
Point Pleasant, NJ

THE MEN in an organization have a similarity of purpose to the extent that they are all working and contributing toward the output of the plant. However, they are each working for their own interests and objectives. Each person in the plant is affected to some extent by the attitudes and interests of the people they come in contact with during the working day. It is foolish to even hope to build up an organization where everyone has the attitude which management regards as the desirable one.

Most organizations make an effort to improve the approach, the industriousness, and even the morality and sobriety of the employees. It is generally accepted that this is a slow operation, and a long-term process at best. The individual employees have had years of practice at being the way they are, so major changes are not expected. The usual method of creating a slow movement in the desired direction is via the printed and spoken word. The company magazine, booklets, bulletin board, and

(Continued on page 326)

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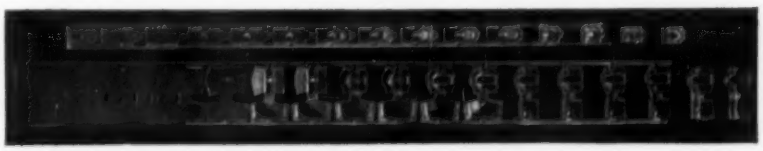

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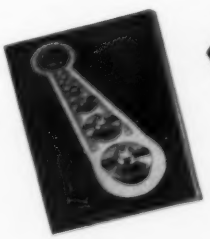

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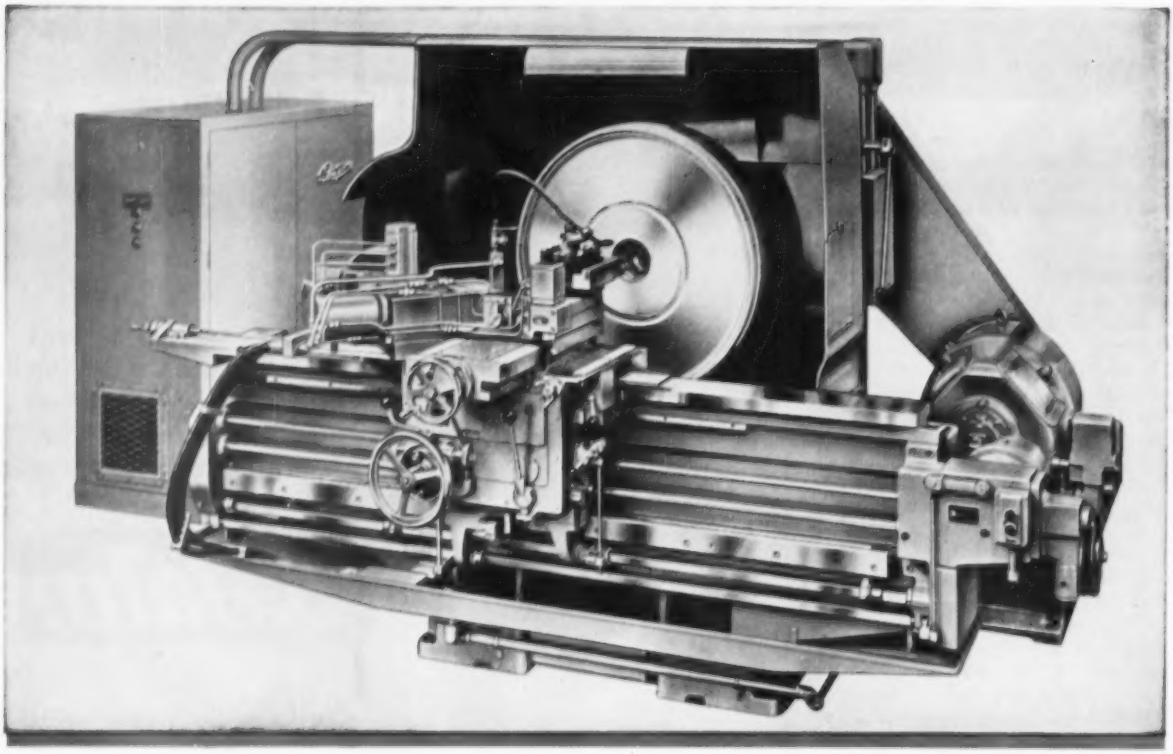

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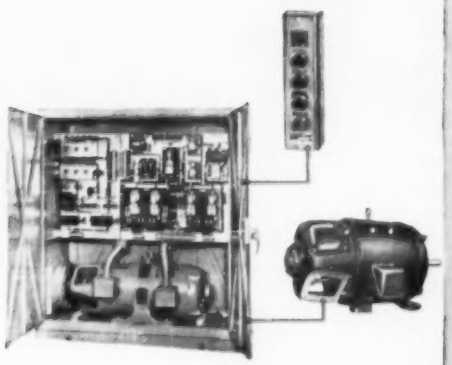

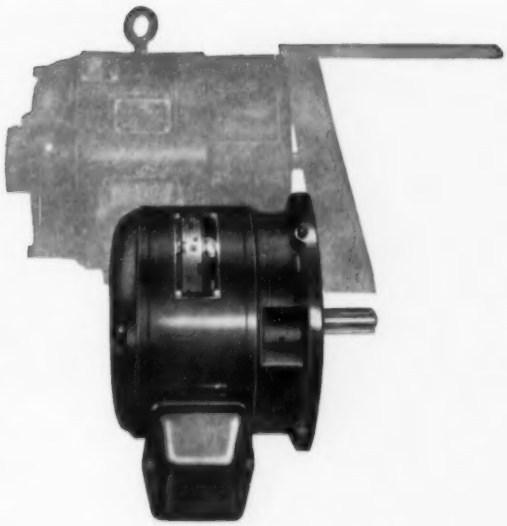

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personal instruction and advice are all used.

This operation must of necessity be performed slowly and carefully, much like the operation of straightening a tree by the application of a light pressure for a period of years. The personality of an individual cannot be changed rapidly the way the hardness of a piece of tool steel is changed by a sudden quench. If an attempt is made to change a person this way, a reaction equal in violence to the cold water on the hot steel can be expected. However, the results are not as predictable.

If Al believes that the situation is bad enough to warrant corrective action, he may approach Nelson provided they are on good terms and are really good friends. People just do not like to be told to do something a different way, or that they should not do something they are doing. A man may have considerable doubt about the correctness of a certain decision, but once he decides on a course of action, it is difficult to get him to change it. Frequently an attempt to persuade him will increase his desire for the original objective, for now he has an additional reason to prove the correctness of his action.

William Sincowski
Woodside, NY

THE STORY is often told that when General Grant started to win his battles during the Civil War, some of his military colleagues and their political friends were none too happy about his success. They couldn't understand why President Lincoln tolerated a drinking man as chief of the Army of the Republic, and one

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• Tube lengths cut accurate to .002"

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of the higher echelon of Grant's detractors was rash enough to voice his opinions in the Great Emancipator's presence. The President looked him over quietly for a moment, then said, "Tell me, sir, what brand of whisky is General Grant partial to?" The rash one admitted he didn't know. "Well, you find out, sir, and I'll send a barrel to some of my other generals."

Of course, it is a far cry from a famous general in a critical period of the nation's history to the peccadillos—real or fancied—of a lowly machine-shop foreman. One thing, however, they have in common, ability in their chosen line of endeavor. Whatever a man's outside activities are, we have to judge a man—in the company sense—by what, for want of a better word, I shall call his productivity. What he does when he leaves the shop must, strictly speaking, be considered his own business. If he is a good family man, a pillar of the church, and a credit to the neighborhood, so much the better. As a rule, the average foreman is usually a decent citizen. But common-sense tells us there must be some exceptions to the rule, that we cannot all be cut from the same moral cloth.

Unless Al has some magic formula for making Nelson see the error of his ways, he would be well advised to close his ears to shop gossip and leave Nelson alone. Foremen will come and go, but the shop gossip goes on forever.

Again, when we mention respect, there are varying degrees of that scarce commodity. For instance, we can respect the ability of a great musician, or a great artist in any

(Continued on page 332)

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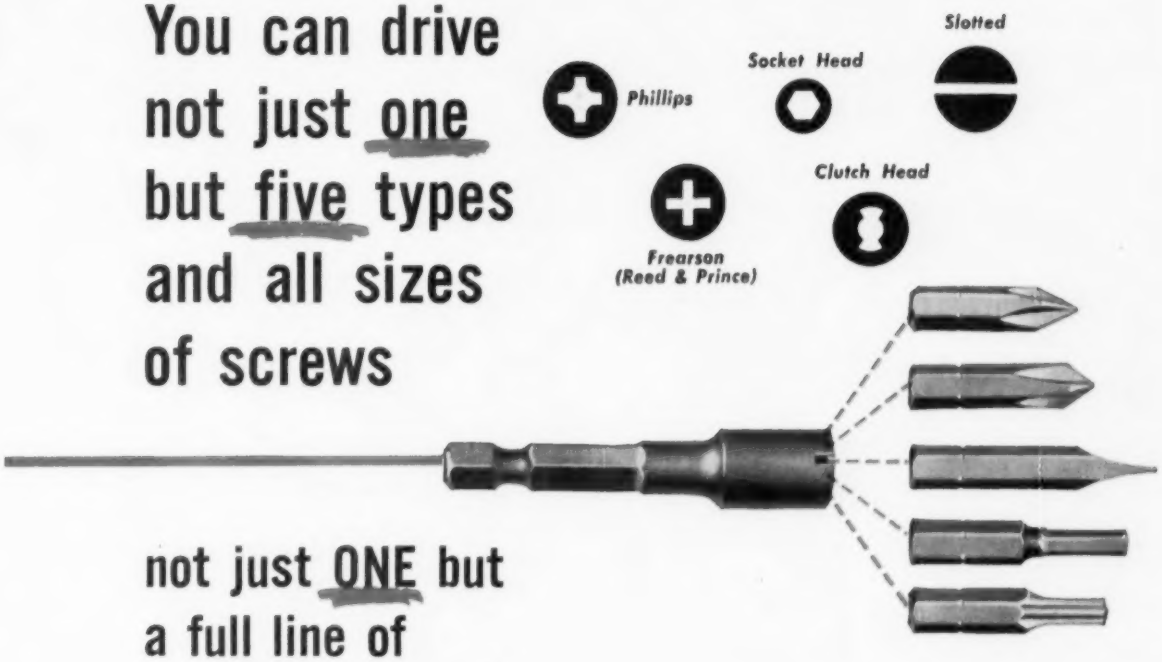
You can drive not just one but five types and all sizes of screws



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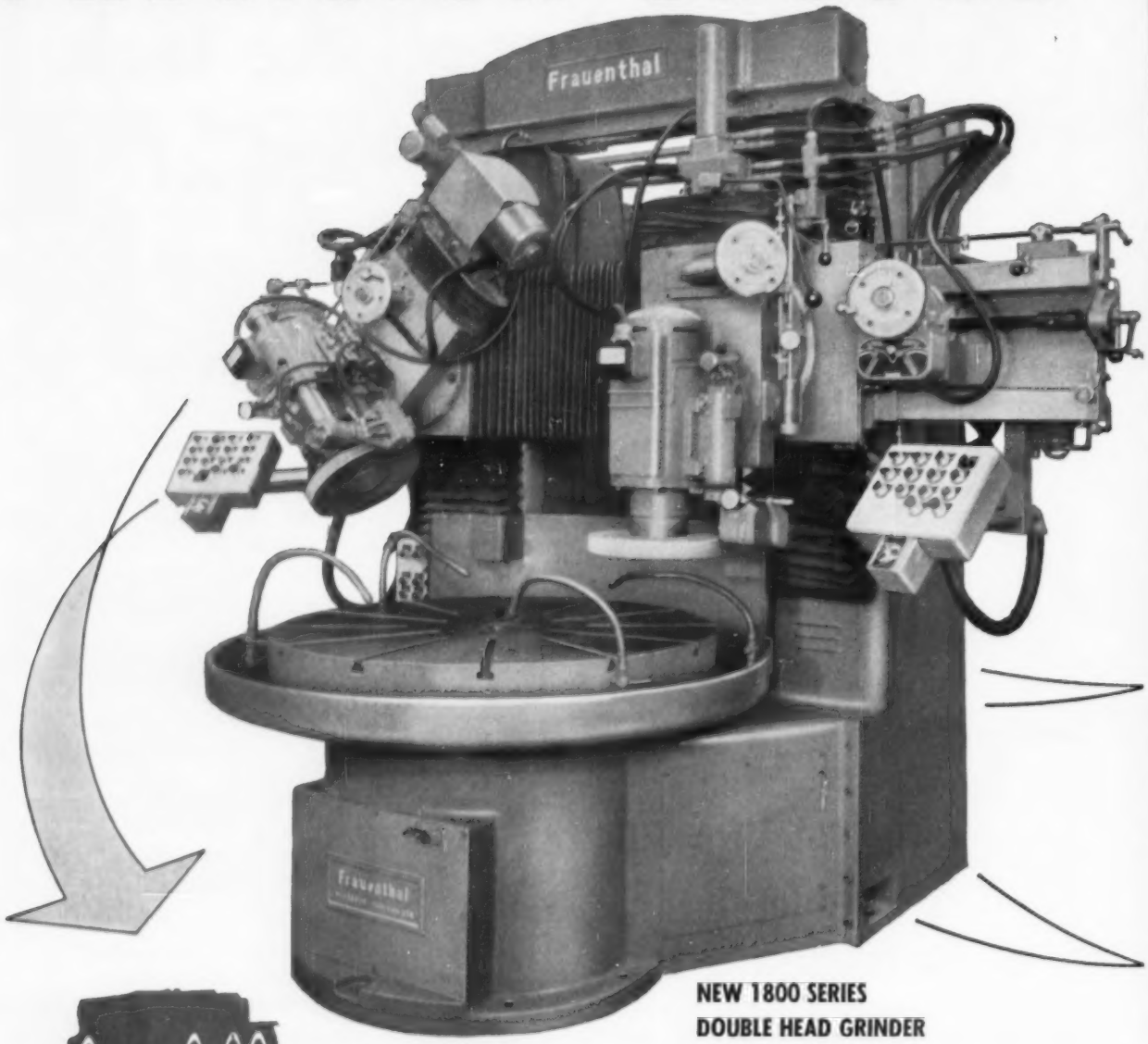

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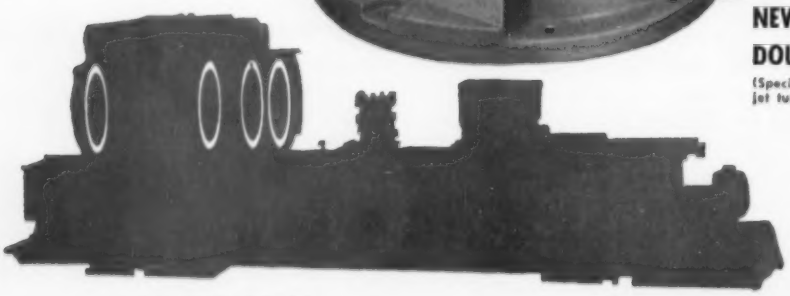

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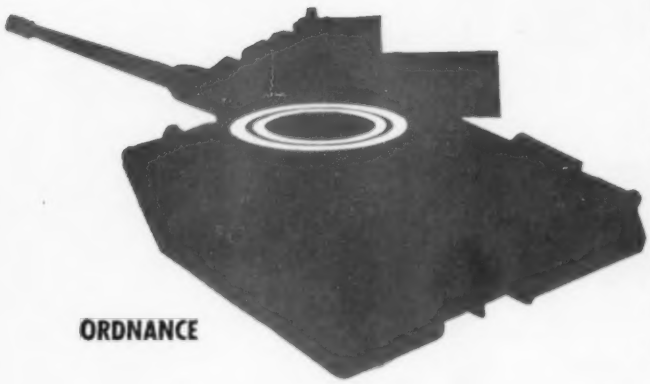

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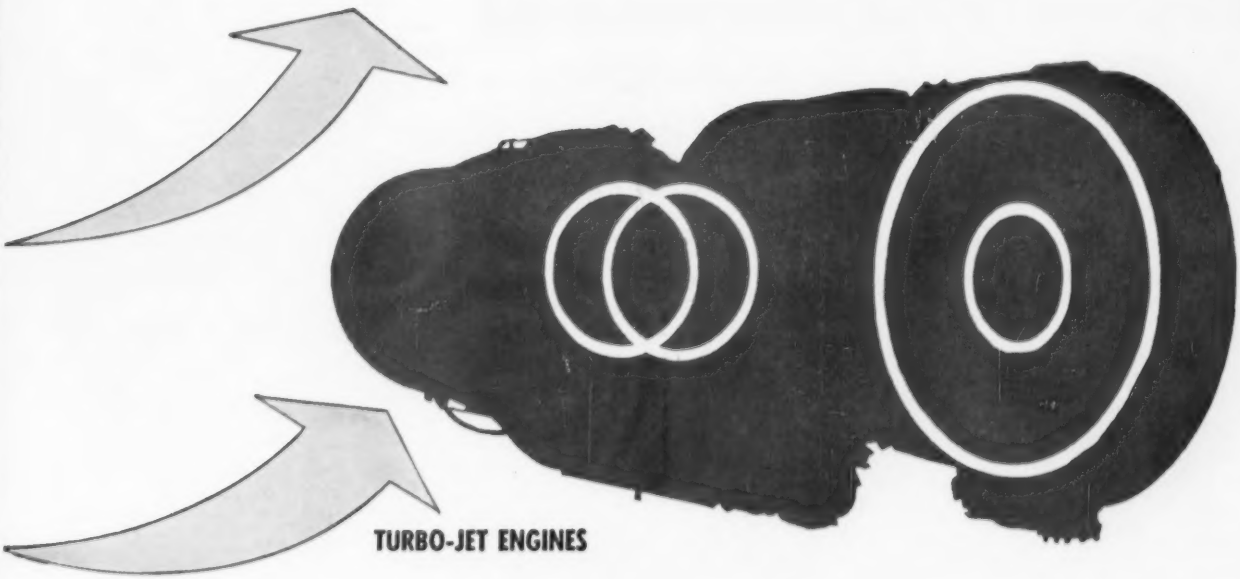

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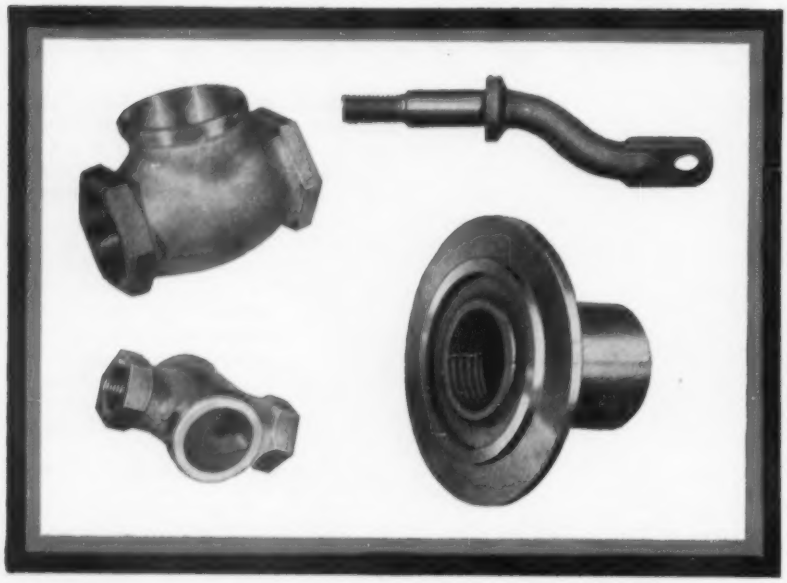
MACHINE TOOLS — Modern day machine tools are required to produce piece parts to greater accuracy than ever before. Therefore, machine tool components must be more precise to the nth degree. With Frauenthal grinders you can grind collets, chucks, spindle sleeves and similar components under simulated assembly conditions to assure concentricity, parallelism and roundness. Eliminate costly and time consuming hand scraping and grind plated parts prior to and after plating for increased wearability.

TURBO-JET ENGINES — Diffuser cases, rotors, compressor discs, vanes, etc., are components of jet engines ground on Frauenthal equipment. Thin section parts, which are unstable due to their design, are ground on the horizontal rotary table of the 1800 and 3100 Series machines. The compound and spindle angle setting features permit the grinding of surfaces normally inaccessible on conventional equipment.

ORDNANCE — Large bearings and housing components for ordnance applications are ground on the 1800 and 2200 Series grinders. Applications vary from aircraft gun turret bearings to the large turret bearings required for tanks, motorized gun carriages, radar and naval gun mounts.

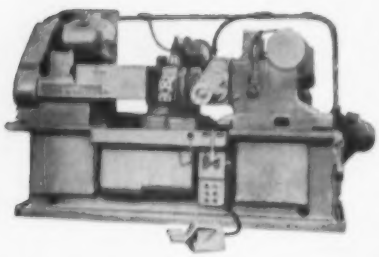
THE KAYDON ENGINEERING CORP.
MUSKEGON, MICHIGAN



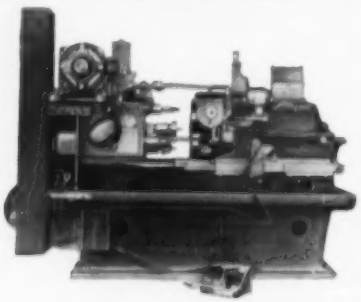
PARTS LIKE THESE and MANY OTHERS ARE BEING PRODUCED

with speed, convenience and economy . . .

on **GOSS & DeLEEUW AUTOMATIC CHUCKERS**



THE "ONE-TWO-THREE" 7-SPINDLE TOOL ROTATING CHUCKING MACHINE can complete in one operation as many as three ends of valve bodies, plumbing fittings, etc. eliminating secondary operations.



4-SPINDLE TOOL ROTATING CHUCKING MACHINES, available in three sizes, combine various turning, boring, facing, threading, multiple drilling and tapping operations on a wide range of single-ended part.

Send samples of your work for time estimates. Ask for illustrated literature.

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

medium and at the same time realize that his or her private life shouldn't happen to a dog.

The idea that all foremen should be like Caesar's wife — above reproach—has a great deal to commend it and, like all great ideals, worth striving to attain; but in the meantime, we have to take men and women as they come. Maybe Al might get something to clarify his thinking from the words of the Scottish poet, Robert Burns, whose private life, incidentally, was not all it should have been. I quote, "Then, gently scan thy brither man, and still more, sister woman, Tho' they may gang a kennin' wrang, to step aside is human."

Robert S Alexander
Glastonbury, Conn

THE THREE monkeys who heard no evil, saw no evil and spoke no evil have been monumentalized because the advice that they freely gave has come to many by sad experience.

There are several reasons why the co-workers of the volunteer chauffeurs in question should ignore the situation.

The reactions of people to the conduct of their fellow-workers is bound to come to light and become obvious to all concerned when a group of people work together eight hours a day. On one hand, people have a tendency to seek out the opinions of their associates on the things they choose to do. On the other hand, by means of teasing and small talk made in their presence, the parties concerned soon become aware that their behavior has a negative effect on others.

If these men neither seek out the

"These shavings come off so cute, I forgot to stop, and cut down to nothing!"

We welcome inquiries

We are specialists in the custom-building of the types of gears shown here. We make them in quantity to your specifications.

Manufacturers who want that kind of wide specialization—and who are looking for a company that can serve as a "gear department" are indeed invited to write or phone. The answer will be prompt.

*REG. U. S. PAT. OFF.

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FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

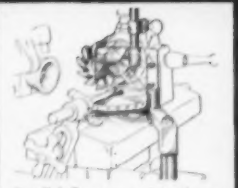
Automotive Gear Works, inc.

ESTABLISHED IN 1914

RICHMOND, INDIANA

Clearance Angle Scale — clearance angles are read directly from a graduated scale on the wheel spindle assembly.

Mechanical Wheel Dressing — an accurate radius is mechanically dressed on the grinding wheel in correct relationship to self-registering tooth rests.



Parallel Gage — end teeth are accurately aligned in a horizontal position parallel to the travel of the carriage.

Here is a completely NEW method for grinding helical cutters...

It's name is

END MILL
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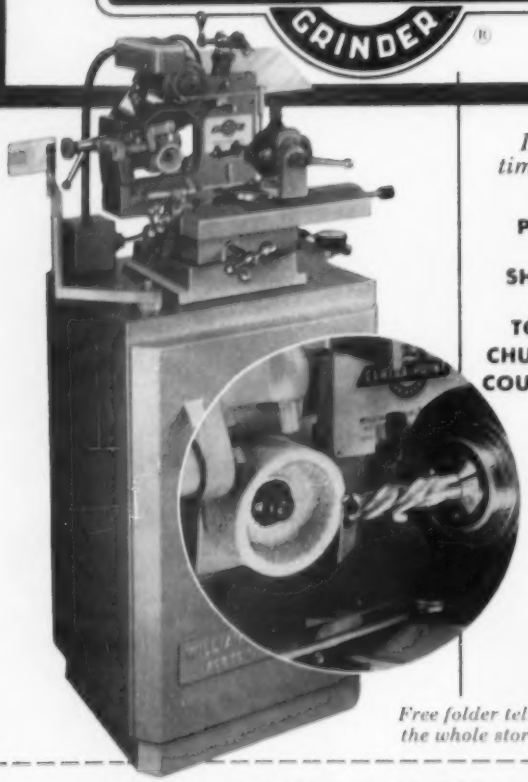
GRINDER ®



It can save you time in sharpening

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PLAIN MILLING CUTTERS
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CENTRA-POINT'S new ball bearing carriage and work-head allow sensitive movement necessary for following helixes of small milling cutters.

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William H. Field Co., Inc., 326 Dorchester Ave., Boston 27, Mass.

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Company _____
Address _____
City _____ *Zone* _____ *State* _____

judgment of their fellow-employees nor allow themselves to be affected by their reaction, then they are too naive to accept any advice that might be given to them. Possibly too, they may be deliberately turning a deaf ear to the echo of the situation.

Neal A Mack
Belle Harbor, NY

AUTOMATION BLUES

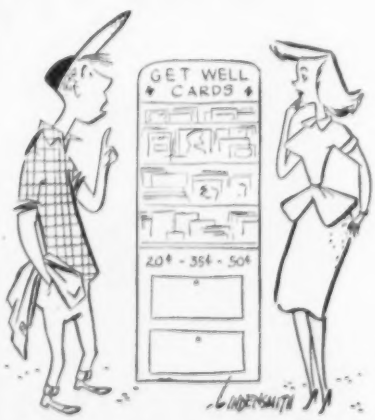
Is automation actually a threat to a worker's job security? Should it be looked on as a system which will eventually replace today's worker, or as a technique that will multiply jobs in other fields?

AUTOMATION—the new technique by which machines now do more intricate jobs without human guidance, is here to stay. Although it may be a bitter pill to swallow for the individual worker whose job is swallowed up in the process, paradoxically, automation promises more jobs, better working conditions and a higher standard of living for most workers.

Most large companies already have or are planning some degree of automation because of its promise of better products and increased productivity at lower costs.

The march of automation is as inevitable as the march of time. The industrial revolution which began when machines were developed to take the place of man's muscles is now being followed by a second industrial revolution whereby automation is beginning to replace man's nervous system as well with machines.

The over-all view of automation



"Something that isn't too encouraging. It's for my foreman."

and its effects should not be disheartening to the worker. The initial impact may result in loss and consequent shifting of employment for some workers, but, on the other hand, automation will release men from dangerous and monotonous jobs. Such workers will find better jobs because increased productivity at lower costs due to automation will result in greater demand for all products.

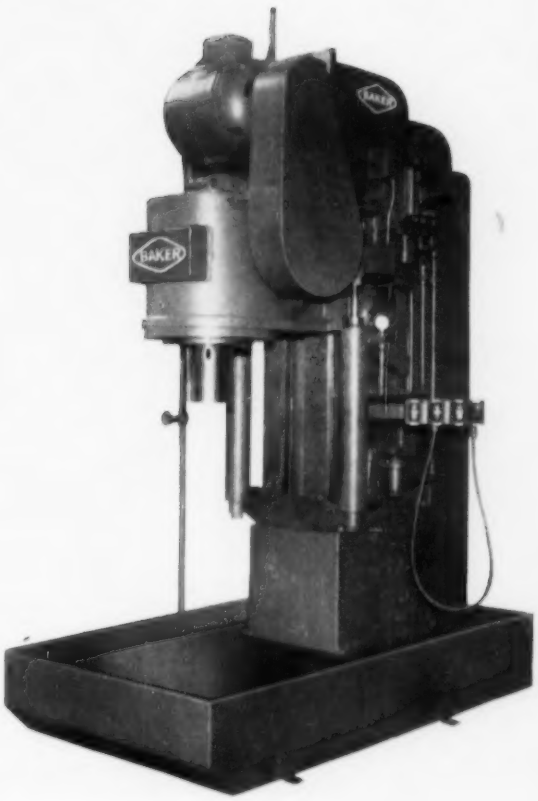
The prophets of gloom claim to see the handwriting of unemployment on the wall of our economy due to automation. But automation will work out differently in practice. New products resulting from this technique will greatly increase the total jobs in our future economy. In addition, it will call for more highly skilled workers.

Automation will give workers something that the modern production system has been taking away from them: pride of workmanship and a sense of responsibility for a completed product. Instead of breaking down each job into its simplest components and leaving it to management to find ways of compensating workers for the loss of satisfaction for putting out a completed product, automation makes one man responsible for a machine than turns out a completely finished product.

I believe it is no coincidence that automation is arriving in a day of fuller peacetime employment than we have ever known before. Automation helped create that day. I am convinced that for the future, increased automation is necessary if we are to prevent future inflation and consequent lowering of our high living standards. In addition, it is estimated that within the next ten years our population will probably increase about 20%; but our population available for work will go up only about 6%. To supply the needs of some 30 million additional people, industry must produce a vastly greater quantity of goods. The only way this can be done, in view of the probable size of the available working force, is to increase productivity per worker through automation.

Harry Kaufman
Philadelphia, Pa

To A shopman who has seen the parade of progress and kept pace with it over the years there is nothing frightening about the word automation, because he has seen its beginning and participated in its



automation pays . . .
EVEN ON SHORTER RUNS

Yes, it does — when you automate with *standard* Baker Basic machines. They cost much less than a machine specially built for only one part . . . and pay off quicker. For example, a manufacturer recently installed 3 Baker Basics on relatively low-production jobs. He estimates that the savings through automatic operation will pay for the machines in 3 years or less. Ultimately he will incorporate these Baker Basics into a transfer machine. Baker Basics can be retooled with comparative ease and at less expense. They needn't be completely "rebuilt" for a change in product or production method. For drilling, boring, tapping and other machining operations. In 5 sizes.

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AUTOMATION
Best in the long run
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Please send free Catalog on Baker Basic machines.

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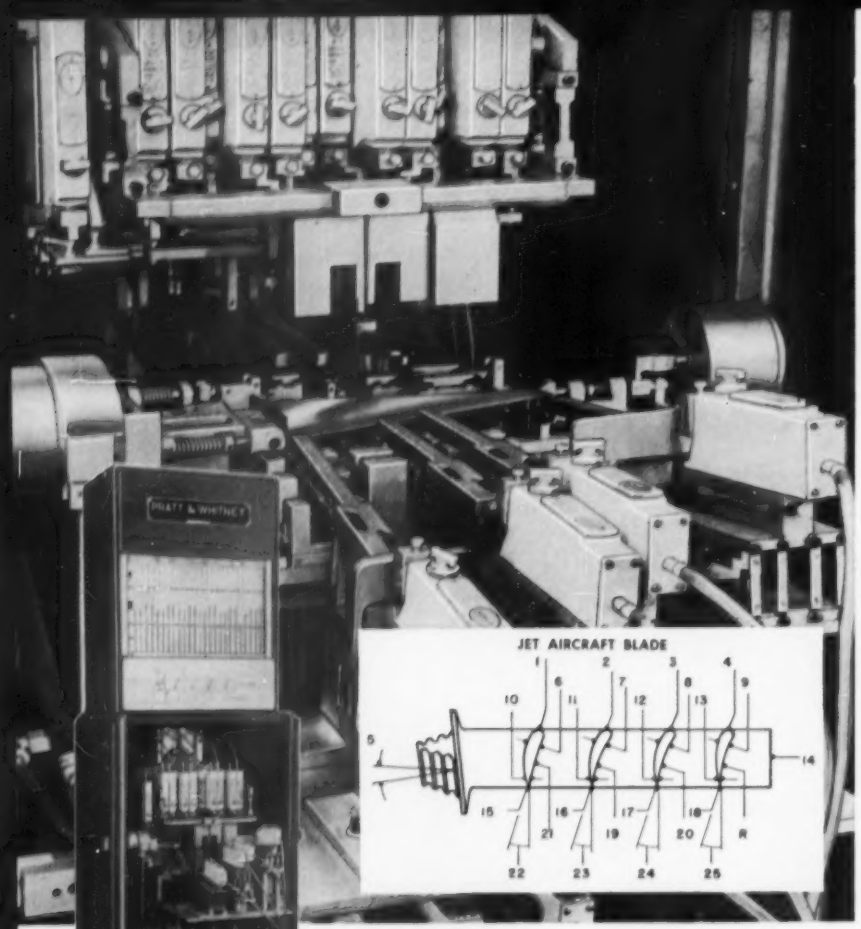

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many dimensions...
rapidly, accurately

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SIGMATIC
GAGING MACHINES

25 CRITICAL DIMENSIONS of jet engine compressor blades are checked simultaneously on this P&W, Semi-Automatic Type, SIGMATIC Gaging Machine. Gaging is fast (up to 350 blades per hour), low in cost and dependably accurate. By contrast, separate gaging of each dimension would be slow, prohibitively expensive, and subject to the element of human error.

Like all SIGMATIC Gages, this machine is versatile . . . able to check several different blade sizes by means of interchangeable gage tooling; changeover takes only about 30 minutes.

For large or small production runs . . . for in-process gaging or final inspection . . . *wherever* many dimensions of complex parts must be closely controlled, P&W SIGMATIC Gaging provides the practical, low cost answer. Use the coupon on the facing page to send for complete information; there's a machine *right* for your needs.

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MACHINE TOOLS • GAGES • CUTTING TOOLS

growth. He also knows its limitations.

He is aware that in order to reap the benefits of automatic operation there must be trained hands and minds to set up and keep in constant adjustment those intricate machines or they will be nothing more or less than heaps of expensive junk. Because no metal part has yet been fabricated that is totally resistant to wear, and wear inevitably leads to misalignment and inaccuracy of the product, there must be someone on hand with the know-how to correct any deviation, with the minimum of downtime. In the mind of the general public, of course, an impression has been given, usually by writers with no mechanical training, that all that is required to keep production flowing by automation is someone to "feed the brute" and press a few buttons.

It might be wise to enlighten them regarding the countless skilled manhours that go into such intricate machines from drawing board to final adjustment on the line. There should be skilled maintenance men, who are familiar with the lubrication requirements of the machine and know what to do in the event of a major breakdown. Tools wear out and have to be ground or replaced, so back of the automation line there must be tool designers and skilled toolmen.

A great deal has been written and conjectured about what will happen to the new variety of displaced person whose particular operation the machine will replace. Just as after the turn of the century the automatic screw machine revolutionized the production of small and medium-

"I don't care if you are going fishing after work, I wish you'd find some place else to keep your minnows!"

Production Doubled
Cost Cut 50%
Product Improved...

TOCCO-METHOD

OLD METHOD

TOCCO heating station with inductor and fixture for silver brazing cylinder and cylinder cap assemblies.

with TOCCO* Induction Heating

The experience of The Commercial Shearing and Stamping Company, who use TOCCO for silver-brazing hydraulic cylinder assemblies, is typical of the benefits obtained by America's leading metal-working plants who use TOCCO Induction Heating for brazing, hardening, heat-treating, forging and melting operations.

More Production with TOCCO

a. Heating time per piece cut from 15.3 minutes to 2 minutes on 5¼" I.D. cylinder.

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Lower Costs with TOCCO

a. Through a reduction in time required for each piece.

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c. Because, since TOCCO is automatic, operator need not be trained or especially skilled.

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a. Because of better looks and sales appeal.

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TOCCO Engineers — can probably find applications in your plant, too, where TOCCO Induction Heating can increase output, cut unit costs and improve your product. Such a survey costs you nothing—and may save you a great deal.

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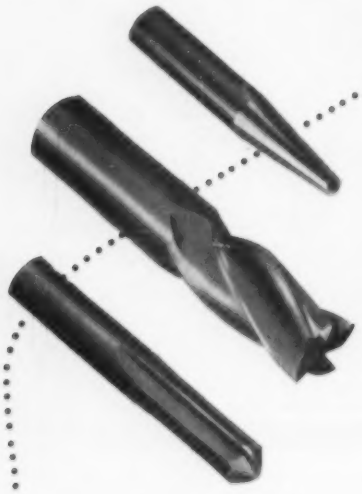

WHY THEY DO YOUR JOB BETTER

All Ford end mills are *precision machine ground from the solid* . . . which insures uniformly accurate flute form and a constant relief angle. On your job, that means more parts per grind. So you save labor on grinding and tool changing. You save on replacements. You save on downtime. What's more, there's less time per part, more parts per hour, fewer rejects. Available in 11 types . . . all standard, and *available*.

Rotary FORD Tools

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M. A. FORD MFG. CO., INC.
735 W. RIVER STREET
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Precision manufacturer of H.S.S. and Carbide Rotary Files and Cutters • Countersinks • Grinding Burrs • Special Tools • Factory Regrinding

sized turned parts and made some single-purpose lathes unnecessary, there was quite a hue and cry about what was to happen to the men whose machines had been rendered obsolete.

Machine shop history has shown conclusively that these men were taken care of and absorbed into other branches of the industry. Production has grown by leaps and bounds since then; work hours have been shortened, and wages have increased. In an era of mechanization, where the trend is toward replacement of antiquated machinery, and the reduction of unnecessary and costly hand labor, there will always be room for the man who has mechanical know-how and is equipped to use machinery for productive purposes.

Wisely used, automation can maintain a flow of material benefits for all and inevitably, in time, as its use increases, reduce the working hours and give mankind more leisure time to enjoy the fruits of his productivity.

Robert S Alexander
Glastonbury, Conn

About the only time when human work won't be required will be when we are lolling around on the other side of the pearly gates. Till then there will be increasing amounts of work for all because of people throughout the world becoming apprised of the advantages of high production and its benefits to all. There seems to be an opinion that automation will sound the death knell of man's earning power. Automation is just another step toward super-production.

We can go back to where man used to have a horse pull him around in a wagon, or take him for a ride on his back, and the calamitous howl that went up when the horseless carriage made its appearance. Dark clouds of gloom prevailed when it was pointed out that this devil-propelled monster would replace the old nag, which in turn would shut the doors of the blacksmith shops, harness-makers and horsenail manufacturers. Horse troughs would be a thing of the past and the foundries that made hitching posts would fold up! Woe is the people! Did the automobile throw the people out of work? Oh brother!

I can remember, as a kid, taking the machinists' tools down to the blacksmith shop to be dressed and rehardened and how interesting I thought it was when one of those leather-aproned artificers showed me how to draw a cutting tool to a dark straw! They were made of carbon steel. Then along came old man Mushet, the air-hardening pioneer who ushered in the army of high-speed steels which in no time threw such a scare into the machinists because they were going to work themselves out of a job by getting things done too fast. The advent of high-speed steel necessitated redesign in the metal turning equipment in order to get the most out of the cutting element. It is obvious that this means lots of work for lots of people. About the time when humanity was reconciled to the improvement of high-speed over carbon steel, and it settled down to take things in stride, along came tungsten carbide to throw a monkey wrench into the status quo. Greater improvement in design was necessary to cope with this new cutting element. It increased production immensely and still the need for labor was greater. Further changes in design—radical changes—were necessary to withstand the extra strain imposed through increased speed and stress. The cost of manufactured product was reduced on account of the increase in production, permitting more people to buy and this in turn created a demand for more production and as a consequence an increase in demand for efficient help. Give up, or shall I continue?

For every advancement in facilities for increasing production came benefits for the worker. So it must be said in all sincerity that high production is the rockbottom foundation of the standard of living of the working class of the United

(Continued on page 342)

"It's our new self-service parts handling system."

THE SAME PROBLEM

KEPT THEM BOTH WORKING LATE!

The production chief wonders how to get more output from his machines. The oiler wonders how to keep them *running*. Both know that vital time is lost when machines must be stopped for lubrication during the day. And yet, without proper lubrication, the threat of breakdown grows. Perhaps if the oiler and his chief pooled their knowledge, they might discover a simple solution to their problems.

Yes, back of lost man-hours, machine downtime, and product spoilage frequently lies the real trouble-maker, old-fashioned lubrication methods. If *you* are looking for ways to increase production and decrease costs, you may find an answer in improved lubrication.

Modern Automatic Alemite Lubrication. A Mid-west manufacturer cut costs $20,000 a year. A paper company saved $3,000 a month. And a textile firm ended substantial production wastes.

The answer: Modern Alemite systems that automatically feed exactly the right amount of oil or grease to every lubrication point . . . that keep machines running longer with less downtime . . . that eliminate oil waste and product spoilage.

Take a look around your shop. Ask yourself if an Alemite lubrication expert might not recommend an inexpensive solution to your lubrication problems. Wherever you are, there is an Alemite representative ready to serve you.

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Gentlemen: Please send me my free copy of "An Executive's Approach to Lubrication Problems." No obligation, of course.

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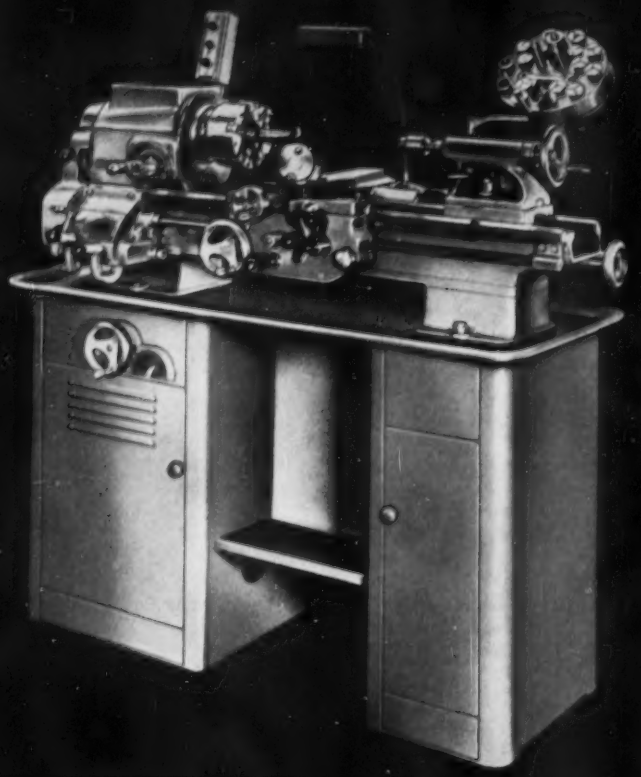

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4-Foot Bed Lathe

DELTA... world's most complete power tool line
53 machines... 246 models... over 1300 accessories

DELTA
5-Foot Long-Bed
Lathe

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DELTA 11" metal cutting lathes

4-Foot Bed Models . . . 5-Foot Bed Models . . . Threaded Spindle Nose Models . . . Tapered Key Drive Spindle Nose Models . . . Single Or Three Phase Motors and Control!

CUT COSTS

There are two sound reasons why Delta 11" Metal Lathes are cutting costs in tool rooms, experimental departments, and production lines across the country:

First: They are *Delta Quality* lathes. The oversized spindle and bed construction make it possible to handle heavy work that normally requires 13" or larger lathes.

Second: Delta's 30 years of power tool design and manufacturing experience—plus big volume—bring Delta quality lathes to you at a lower price than any other comparable lathe!

And only DELTA gives you all of these lathe advantages:

EXCLUSIVE DRIVE SELECTOR—Select every drive position simply by moving one lever—direct drive, gear drive, loose spindle, locked spindle.

BUILT-IN SAFETY—Lockout feature on drive selector prevents stripping of lathe gears. Electrical Disconnect prevents lathe from starting while gears are exposed (optional).

PERFECTED VARIABLE-SPEED DRIVE—An infinite choice of speeds from 45 to 1550 rpm—plus the power of matched V-belts in the final drive to the spindle.

CHOICE OF SPINDLE NOSES—Conventional 2¼"-8 threaded or modern L-00 tapered—at no extra cost.

See the entire Delta 11" Metal Cutting Lathe line—get all the facts! Then, make up your own mind! Your Delta Dealer is listed under "TOOLS" in the classified pages of your phone book. Send the coupon for full details.

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Send for all The Facts NOW!

DELTA QUALITY POWER TOOLS

Another Product by **Rockwell**

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☐ Please send name of my nearest Delta Dealer.

☐ Please send Delta Industrial Catalog on the complete Delta 11" Metal Cutting Lathe line.

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Versatility Plus

with the

KING PORTABLE BRINELL HARDNESS TESTER...

King Portable Hardness Testers pay dividends where operating ease and guaranteed accuracy are essential. Portable, rugged and dependable, they have almost unlimited applications.

King Hardness Testers can be carried anywhere to test materials in any position. They put a full load of 3000 kg. on a 10 mm. ball, and give a clear, sharp impression. Hardness readings are taken faster and easier. The removable Test Head can test parts of any size.

Kings offers a full range of models and adapters to test spots where other testers cannot reach. Included are: King Test Head for Deep and Offset Testing to reach around corners and into holes—King Reverse Load Adapter to secure easy readings inside pipes and tubes—King Gear Tester for testing gear teeth on the pitch line—and new King Brinell Microscopes for faster reading.

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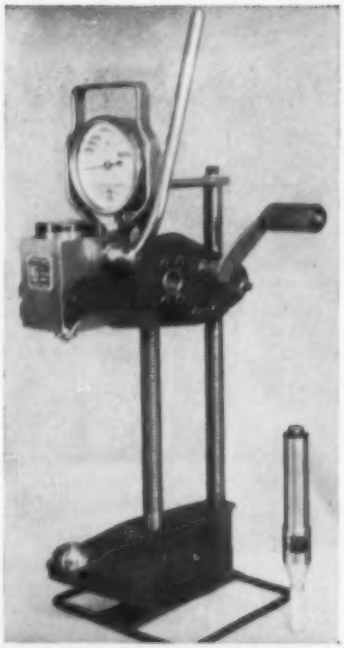

KING TESTER CORPORATION
13th AND BUTTONWOOD STS.
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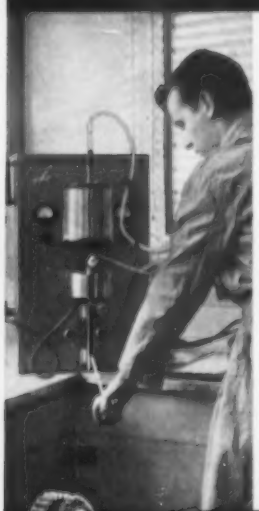
Another of the Reasons Behind Brad Foote Quality—

CARBON DETERMINATION



• In hardening gear teeth by carburizing, carbon content and depth of penetration are vitally important. BRAD FOOTE insures precise control of these factors through metallurgical tests with equipment developed specifically for this purpose.

• A test bar goes through the complete carburizing and heat-treating cycle with every batch of carburized gears. Shavings are taken from this bar at carefully measured depths. Chemical analysis of these shavings gives complete and precise data on carbon content and penetration.

• Carbon determination tests are only one of many metallurgical controls that insure the uniform quality of BRAD FOOTE Gears. Metallographic examination, hardness testing, chemical analysis—these are just a few of the quality checks provided by BRAD FOOTE's completely equipped metallurgical laboratories.

• Add these precise controls to specialized production and heat-treating equipment and a wealth of detailed experience in producing gears of all types—you begin to appreciate why BRAD FOOTE can produce better quality gears at substantial savings.

• Find out how BRAD FOOTE quality can save you money. Send us the specifications on your next job for quotation. No obligation of course. BRAD FOOTE MAKES ALL TYPES OF GEARS—IN A COMPLETE RANGE OF STYLES AND SIZES

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States. Someone has said that automation may be considered as the floor upon which a higher standard of living can be built. Can anyone in his right mind consider that automation is but a rope upon which civilization will strangle? We have developed scentifically to the point where we have continually turned out new products at such a rapid rate as to create jobs for more than the jobs replaced by technological advancement.

Just to show what benefits new products mean, and why machinery should be self-operating in order to relieve the labor shortage in other necessary duties, it may be pointed out that General Electric alone has 45,000 people today who are making products that were unheard of fifteen years ago. Rest assured there will be 50,000 in a few years.

There is a limit as to how far humans can manipulate levers, pushbuttons, and foot treadles and be able to keep pace with this mad rush to produce. We have to rely upon things of an automatic nature in order to maintain our physical balance and mental stability. It is automation that is saving America from driving itself crazy with the heat of production.

J Homewood
Burbank, Calif

As LOVERS of the night, and knights of the "Round Table," we contemplate on "Automation Blues." We see automation as the prelude to a better, richer, more colorful life in this material world full of spiritual people. Like Norbert Wiener we see automation leading to "the human use of human beings." We

"I got this in the accident . . . The rest was for breaking the shop's safety record."

R B&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By John S. Davey

The Proper Loading of Bolts

The pre-load, or residual tension, in a tightened bolt means more to assembly strength than the actual strength of the bolt itself.

In a joint, a bolt torqued to its proper load level resists a maximum amount of external load without loosening. Designers can take advantage of this fact and assure better results, and at the same time, cut costs.

For example: One designer calculated that truck frames needed high strength bolts at least ½" in diameter. So he used ⅝". But on the assembly line, these were being torqued to 100 ft.-lbs. whereas they needed at least 200 ft.-lbs. for proper residual tension. The ½" bolt at 100 ft.-lbs. would actually have given the stronger assembly and at less cost.

In another case, the bucket on earth moving equipment was always coming loose. The design engineer kept increasing the size of the bolt up to 1¼", but to no avail. The impact wrench used was supplying far too little torque for this size. We suggested a return to the original ¾" bolt used, set up to 350 ft.-lbs. torque. It solved the problem.

In short, the more you stress a bolt within its elastic limit, the greater its ability to stay tight and make a strong assembly.

Symmetrical flow lines assure strong bolt heads

Photo of perfect cold worked blank after first upset.

Effect of improper forming is a poor head like this.

IN THE manufacture of bolts and cap screws, the first upset of metal is a vital one. It determines the flow lines in the bulb which will form the head. A symmetrical flow assures no laps and, therefore, no weak spots or cracks in the final upset of the head.

MACHINE OPERATOR'S SKILL VITAL

The upper photo shows a longitudinal section of a blank after the first upset and on its way to becoming an RB&W standard bolt. Note the even distribution of flow lines. This bulb will become a perfect head.

The lower photo shows what can happen with poor tools, inexperienced operators or without precision setup of the cold headers. Note how pronounced is the unbalanced flow pattern which resulted from a bulb with just a minute defect.

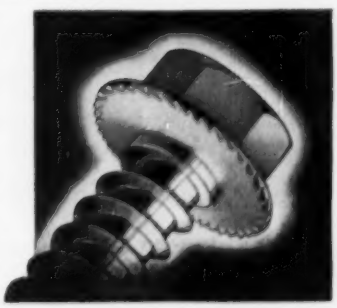
DEPENDABLE FASTENERS

Cap screws and bolts also get a bright smooth finish from the right kind of cold forming. But above all, they offer the designer low cost fasteners with sound internal structure. Standard RB&W fasteners can be loaded to their proper level —become a strong point in any assembly.

For help on your fastener problem, contact Russell, Burdsall & Ward Bolt and Nut Company. Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

The Only Screw That Stays Tight

The continual heating and cooling caused loosening of handle screws on the flat irons of one manufacturer. Every type tried failed to stay tight until RB&W's unique Spin-Lock tapping screws were used. This solved the problem. Their hardened teeth lock into the surface, require more torque to loosen than to tighten. One piece fasteners, they speed assembly time.



an ACCO product

HERE IS ACCO'S GREAT NEW

Shaped Section Master Link for industrial slings

Holds its form under loads up to 18% greater!

ACCO—long a recognized leader in the design and manufacture of slings and attachments—now comes up with the sensational new SHAPED SECTION MASTER LINK for slings. Instead of having the conventional standard round section, this new master link has a *shaped* section which withstands deformation under loads up to 18% greater!

Just as a structural I-beam can handle greater loads than a solid beam (of the same weight), so does ACCO's Shaped Section Master Link give better performance under greater loads than does a link with a round section.

Better Quality—Costs No More

The new Shaped Section Master Link is a *better quality* link. It has a smoother surface. It provides greater safety for men, machines and materials. It costs us more to make—yet there is *no increase in cost to you!*

Made of Accoloy, the Shaped Section Master Link is made in all sizes from ½" through 1¾". It is available as a component of American Chain slings—also separately, for use with any make of chain or wire rope sling. *Ask your sling distributor*, or write our nearest District Office for full information.

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Better Value

see man free of tedious labor and accepting the opportunity to use his talents to reflect greater glory upon the God in whose image and likeness he was created.

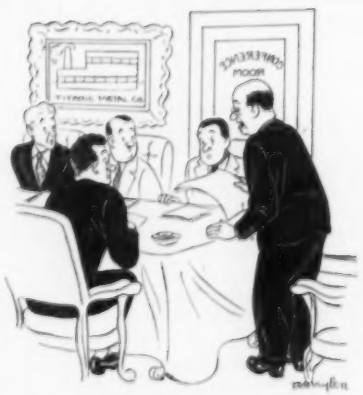
Automation is not mere technological progress. It is social revolution. It is a giant step in the advancement of civilization. It is the prelude to a new era of American culture. It is an opportunity to wrest the laurels from the brow of ancient Athens, where civilization reached its peak.

Athenians had time to contemplate, to delve into the spiritual secrets of man. Work was done by slaves. A great, but pagan, culture developed. Automation will give us more time to devote to that which is of spiritual importance to man. Machines, not men, will tend the mechanical equipment which promotes our material welfare. Like the Athenian citizen, the American workingman will have more time to devote to building a life and less to earning a living.

Automation has no inherent harm for the worker. It will not swallow job opportunities. It will not kill skills. Managers, educators, capitalists have more to fear from automation than has the worker. They have money and prestige to lose. The worker has freedom from drudgery to gain. From the automation blues will come the gold for a better life.

We are even now in the whirls of a tremendous social revolution. Husbands and wives are free of the fear of raising large families. Cramped, unattractive living quarters are disappearing. There are more and better schools. We have good wages, job security, pensions, and social security to eliminate the

(Continued on page 348)



"According to these reports we have been out of business for the last six years."

Sick slab roll recovers fast with application of STANOGEAR *Compound*

A slab roll at Matthiessen & Hegeler Zinc Company, La Salle, Illinois, was sick. It suffered from repeated roll neck bearing failures. Bearing temperatures couldn't be controlled. A consultant was summoned—Marshall J. Fox, Standard Oil lubrication specialist. His diagnosis and remedy: Install STANOGEAR Compound and equip the machine with a central pressure system for application. Recommendations were followed. Result: No bearing failures, due to faulty lubrication, since. Maintenance costs reduced. Time lost through breakdowns slashed.

This was a condition made to order for STANOGEAR to remedy. And Matthiessen & Hegeler knew there was a man at hand who could suggest what should be done. It's another demonstration of what this unbeatable combination can do when put to work:

1 **Standard Oil lubrication specialists capable of giving technical help.**

2 **Top quality products *that deliver results required.***

STANOGEAR Compounds contain special additives making them suitable for applications where heavy loads cause welding, seizure or scoring.

In the Midwest and Rocky Mountain states, a Standard Oil lubrication specialist in your nearby Standard Oil office will gladly give you more information about STANOGEAR. Call him. Or contact Standard Oil Company, 910 So. Michigan Avenue, Chicago 80, Ill.

Eugene Ewald (right), Mill Foreman, and Marshall Fox, Standard Oil lubrication specialist, inspect slab roll. STANOGEAR Compound helped solve lubrication problem on roll neck bearings.

Marshall Fox who proposed switch to STANOGEAR with resultant improved operation, is experienced in providing such technical service. Marsh has a Mechanical Engineering degree from Purdue to qualify him for this work. In addition, he has completed Standard's course for sales engineers. This experience and training, customers find, pay off *for them.*

STANDARD

STANDARD OIL COMPANY

(Indiana)

HOW YOU CAN SAVE THIS ALL-PURPOSE

ANOTHER DENISON FIRST
DENISON MULTIPRESS
SIMPLE TO INSTALL
Only 24" high, 12½" wide, 19½" deep.
EASY TO SET UP
Ram pressures to one-ton with peak operator safety.
8" OF DAYLIGHT WITH 3" STROKE
for easy setup of dies and fixtures.

MONEY WITH PRESS

New!
1-TON DENISON
Hydraulic Multipress®
featuring pressure reversal

Industry's most versatile production tool that:

SIMPLIFIES OPERATIONS because Multipress cuts down operator fatigue. There is no pulling of levers . . . no kicking pedals.

INCREASES PRODUCTION because Multipress cycle time is *faster.*

PRODUCES HIGHER QUALITY WORK because ram pressure and time dwell are precisely duplicated *on every stroke.*

IS COMPLETELY SAFE TO OPERATE . . . safeguards against accidental tripping.

And gives you these plus benefits:

Precision ram alignment with tools and fixtures.

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Type of Operation	Type of Material
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☐ Marking	☐ Brass
☐ Punching	☐ Aluminum
☐ Trimming	☐ Plastic
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To assure you of increased production . . . smooth chatter-free cutting action . . . more reamed holes per grind . . . longer reamer life . . . holes that are extremely accurate and having finest finishes . . . your local W & B distributor stocks a complete line of high speed reamers.

In the complete W & B line you will find reamers of every type. Each type is designed from years of experience to provide you with highest efficiency reaming on specific jobs. "There's A Big Difference In High Speed Reamers" . . . Look to W & B for that difference!

Call your W & B distributor for quick delivery of in-stock reamers that will best meet your needs. For reamer literature or additional information, write direct.

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Hercules Straight Shank Chucking Reamers.

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Hercules Straight Shank "Altercut" Chucking Reamers.

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NO. 266 . . .
Hercules Stub Screw Machine Reamers.

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fear of old age. The sun has already risen.

In 1953 there were 3 million babies born in U. S. hospitals, in 1954 there were even more. By 1965 there will be 30 million more Americans with material and spiritual wants to be satisfied. But, there will be two hundred thousand less people between the ages of 25 and 40 to satisfy these wants. We are facing a great labor shortage.

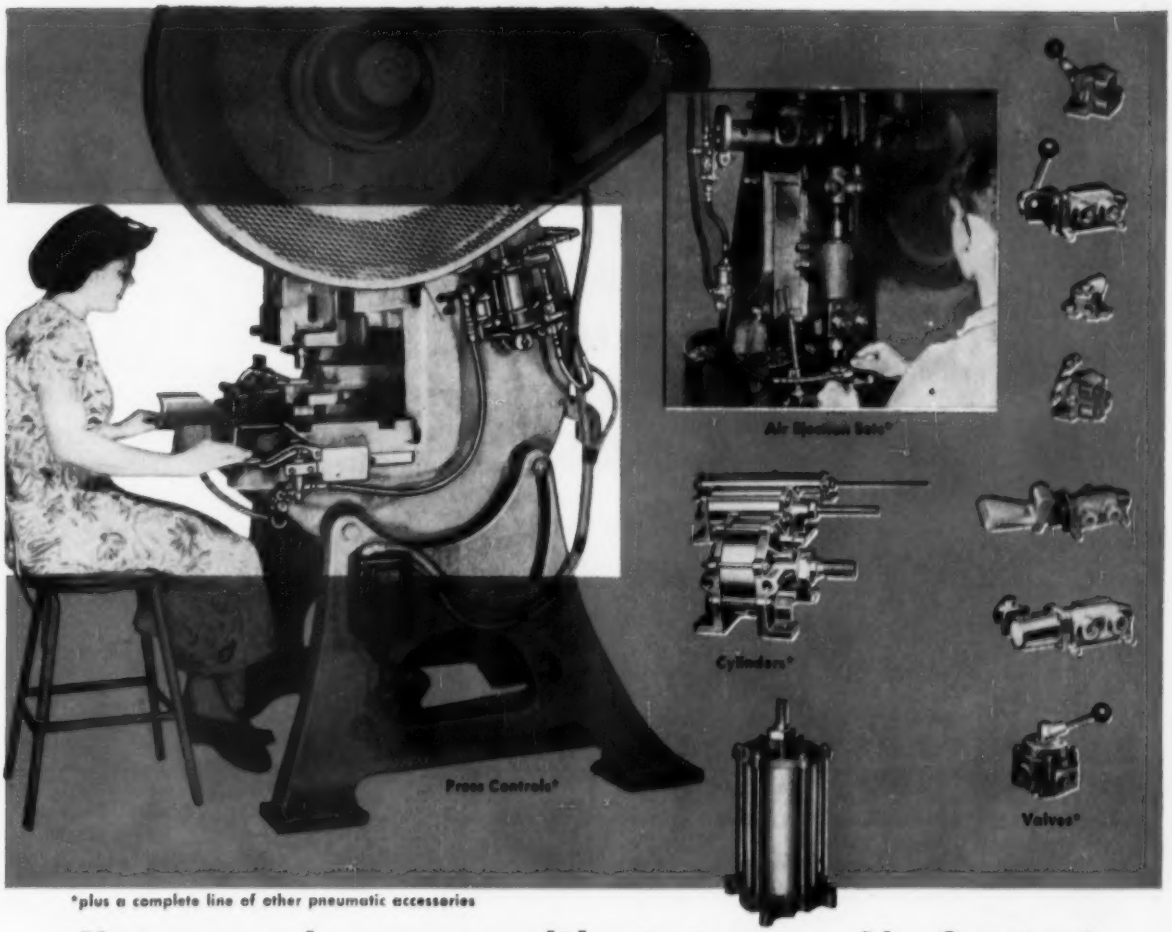
By 1965 disposable income will have increased by 130 billion dollars. Automation is necessary to produce more goods for more people at less cost with a reduced working force. Automation is the only thing that will save a materialistic-minded America from ruinous inflation.

Managers fear automation more than does the worker. Automation will improve the competitive position of small business and multiply such competition. Automation will require workers of greater and more varied skill, managers of greater intelligence with a broader educational background, and financial interests with a much stronger capital structure.

The big corporations are decentralizing. The trend is to smaller plants and more of them, to the development of manpower to provide managers capable of meeting broader responsibilities, to acquiring more capital, to encouraging every worker to save some of his money and invest it in private enterprise.

Managers of an automated industrial enterprise must know many months in advance exactly what people are going to want. Designs must be carefully prepared and tooling perfected. Once automated

"We're either going to add another bathroom or marry off three daughters!"



*plus a complete line of other pneumatic accessories

Harness air power with Schrader Air Control

On many machines, Schrader Control Sets will actually double your production by replacing tedious, time-wasting manual operations with swift, safe, sure movement by air. In other locations, Schrader Valves, Cylinders and other Air Line Accessories lift... lower... pull... push... clamp... clean off. They do many things so easily and quickly that you'll find it hard to believe you did without them before.

Take a look around your plant—keeping in mind where air power could do the job better. Then let us help you develop your ideas into neat, efficient air line hookups that will pay for themselves over and over again the first year. For specific information, write—or, if you prefer, fill out the convenient coupon below.

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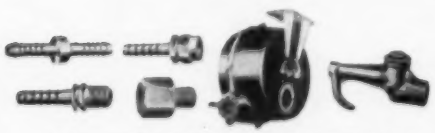
LEADERS IN AIR CONTROL SINCE 1844



The complete Schrader line of pneumatic accessories includes everything you need

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Never Before Such Versatility and Accuracy Available in its Price Range!

K. R. WILSON'S NEW FOUR COLUMN DOWN-ACTING HYDRAULIC PRESSES

Here's the Guided Platen Press that's setting new standards in efficiency, low cost metal forming and drawing, plastics and rubber molding, laminating, die cutting, assembling, die tryout, pressing and many other applications that require precise control of an accurately guided platen. Here are the details:

A standard line of 25-200 tons capacity four column presses built to accuracy heretofore obtainable only from costly custom-built presses. Platens are align-bored to optically controlled tolerances.

Operational Features: variable pressure • adjustable stroke • adjustable daylight • wide range of speeds • fast traverse with slow pressing • variable speed • manual, semi-automatic and full automatic controls.

Design Features:

- PLATENS ARE ALIGN-BORED for greater accuracy.
- EXTRA-LONG PLATEN GUIDES have renewable bronze bushings and lubricating fittings.
- POLISHED AND GROUND COLUMNS resist wear and increase accuracy of platen travel.
- MAXIMUM STROKE SAFETY LIMIT CONTROL prevents damage to dies or press due to over-travel of platen.
- COMPACT, SELF-CONTAINED PUMPING UNITS insure dependable, trouble-free service.
- CUSTOM ACCURACY, custom quality at standard line prices.

Get full details and complete specifications. Write for Bulletin No. 95.

HYDRAULICS DIVISION

K·R·WILSON·Inc.

210 MAIN ST., ARCADE, NEW YORK

production is started no changes can economically be made. Capital investment will be greater than ever. Mistakes will be very costly.

Educators must give up training a man for his first job. The engineering degree will be obsolete. The demand will be for educated men with a knowledge of science. The technical school graduate will receive an AB degree for his training in the humanities and a BS degree for his knowledge of science. He'll learn that the world is full of people and how to deal with them. He'll know what the material wants of man are and how to use science to fulfill them.

Automation is not something new. The rapid increase in its utilization is new. According to Life Magazine, July 18, 1955, automaton first came to the United States in the 1790's. Oliver Evans designed, constructed and put into use a flour mill powered by three water wheels and operated by one man.

As Peter F Drucker points out in his current series of articles in Harper's magazine the increase in the number of managers will be the largest of all the social impacts of automation. Managers must be developed who can predict a stable and expanding market. Managers who know people, economics, politics, and the vagaries of human nature.

Automation may take the slide rule from the engineer and give it to the philosopher, the wisdom of Aristotle from the thinkers and pass it along to the scientists. It may turn the world upside down. It may blend the scientist's ability to use the materials and laws of nature for our material welfare with the philosopher's talent for seeking absolute truth.

From the "Automation Blues" we

"And remember if there's one thing I can't tolerate in an assistant, it's ambition!"

see nothing but a more glorious day for ourselves and our posterity. As every twenty-four hours the sun rises from the blue of the night into the gold of the day man uses his past experiences and failures to promote a better tomorrow. Automation is our newest facility for this accomplishment.

Let's do our part to promote automation, to make this a better world in which to live.

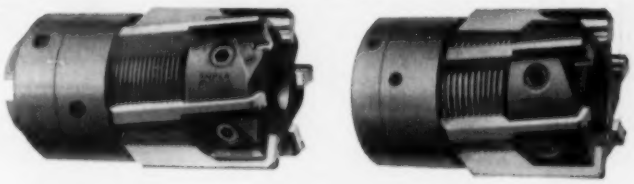
Peter A Seward
Swampscott, Mass

Automation has one main purpose, the easing of human effort. This magic word, automation, finds frequent mention these days in industrial circles; it is spoken in both hope and fear. It is a word which is widely used but little understood. Not that it is a new development or that its meaning and potentials have not been explained by experts in just about every field utilizing such techniques. Automation goes back to 1784 when Oliver Evans built a flour mill in Philadelphia that operated without a worker. In the modern industrial sense automation means fully automatic production without human intervention. This concept was pioneered by Henry Ford's assembly line system.

The whole process of automation is over-simplified by the layman who sees it as a robot, pushbutton, inhuman factory. It is this concept that puts it in the light of a threat to employment. The advocates of automation regard it as the best and really the inevitable way to increase production. While automation could eventually lead to the fully automatic factory such a vision is in the far distant future. There is much research and development work to

"How are you making out with that new apprentice?"

McCROSKY



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REAMERS

Chucking and Shell Designs
Sizes from 15/16" to 6" in Diameter

• McCrosky Reamers combine the strength of solid reamers with the longer life, greater accuracy and lower cost of replaceable blade reamers. They cut freely without chatter, avoid any tendency to "dig in", and produce absolutely round, concentric holes with high finish. Our pin and screw blade locking device permits the blades to be released easily, and adjusted and reground quickly and accurately. Machine chucking and shell designs. High speed, cast alloy and carbide tipped blades. You'll produce more pieces — better — at lower cost with McCrosky Reamers. *Write for a bulletin today!*

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Gentlemen:
Please send Bulletins describing the tools checked below.

☐ Jack-Lock® MILLING CUTTERS
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Yes, we do hundreds of stamping jobs without making special tools—and there's a good reason for this. In stamping out laminated shims for over forty years, we've developed much special equipment and tooling unknown in the average stampings house... including an arsenal of blanking dies and punches...and we've acquired unusual production techniques and skills. This equipment and these special skills are at your service without charge.

ROCK-BOTTOM PRICES . . . BY THREE METHODS!

These three separate production techniques are judiciously applied to save you money on your stamping needs!

MACHINE CUT METHOD. Regardless of quantity, we have the method that fits your needs best! For half-a-dozen or a few hundred stampings, our *Machine Cut Method* produces the stampings at amazingly low cost.

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PRODUCTION METHOD. Or we shift to our *Production Method* using high speed self-feeding presses.

For full information, send for our free 12-page booklet "Service In Stampings." And next time you need stampings, why not let us bid—and discover the savings we offer you!

LAMINATED SHIM COMPANY, INC.

STAMPINGS DIVISION

"ONE PIECE OR ONE MILLION"

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be done and many phases of growth to be passed through first.

Automation is not a menace to be feared by labor, for it will create more jobs, create more products at less cost and increase the ability of the people to consume. It is a technique which will give us more production with less human effort and thus raise our standard of living. Automation has already brought us to the threshold of a new industrial revolution; it is essentially an extension of mass production, made possible by the use of electronic controls for feed back or self correction — a whole system now summed up as "servomechanisms."

Many problems must be solved before the widespread adoption of automation can be achieved. All industry must learn to think in terms of automation and decide just what we want and how we can achieve it. Even when all the machines needed for automation have been developed it will still be necessary to recognize that machines cannot be substituted for people.

When automation's day arrives it will end a lot of human drudgery. Just as mechanization ended the six day week, so likewise automation will expand output while slashing working time in the factory, the office and the home.

D Barton
New York, N Y

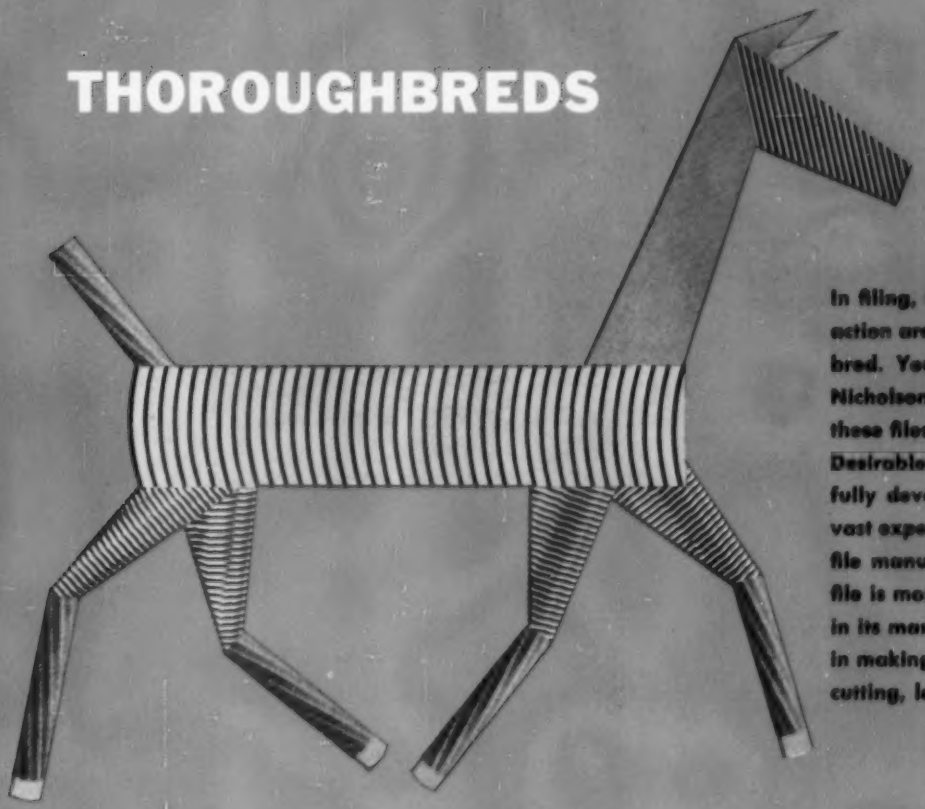
NO TIME TO THINK

Is it necessary for the foreman to be always available to answer questions or solve problems for the men in his department? Will the men become too dependent upon him, and refuse to think out their own solutions or answers?

The man who never has time to think is that way because he doesn't

'Boy! Am I sleepy? I worked half the night trying to assemble the lousy coaster brake on my kids bicycle."

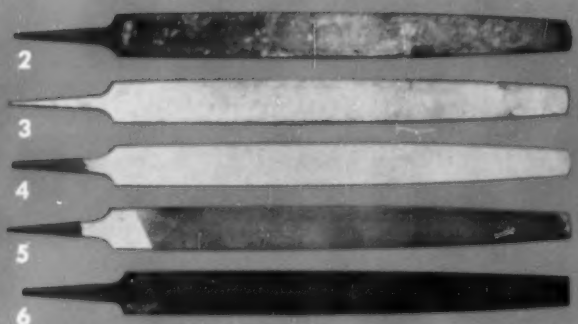
THOROUGHBREDS



In filing, too, stamina and smooth action are attributes of the thoroughbred. You'll find them in every Nicholson file. The "blood lines" of these files go back more than 90 years. Desirable file traits have been carefully developed, drawing on all the vast experience of the world's foremost file manufacturer. Greaming of the file is most painstaking at every stage in its manufacture. Nothing is spared in making every Nicholson file a fast-cutting, long-lasting thoroughbred.

How a thoroughbred file is born

1



2

3

4

5

6

7

1 Steel blank. Much metallurgical research goes into alloying and selecting steels. After close inspection of steel from mill, Nicholson cuts blanks of right cross section (round, flat, etc.) to length.

2 Rough shaping. The blank is heated and forged. With triphammers and rollers, both tang and point are properly shaped, and checked for conformity with a model file.

3 Annealing. The blank is heated, then cooled slowly under carefully controlled conditions to make internal steel structure uniform, and accurate tooth cutting possible.

4 Final shaping. Annealed blanks are ground or milled to proper shape, then drawfiled to produce perfectly true surfaces for accurate, uniform teeth. All decarburization is carefully cleaned off.

5 Forming teeth. Fast-striking chisel displaces metal in annealed blank, raising teeth into desired pattern. For double-cut files, this operation is done twice, forming diagonal rows of teeth.

6 Hardening. Bath of red-hot lead raises file to precisely controlled temperature. Quenching solution follows, bringing cutting edges to maximum hardness.

7 Finishing. File is cleaned and further sharpened by sandblasting. The tang is reheated for strength without brittleness. After tests by trained experts, file is oiled and packaged as one of "Twelve perfect files in every dozen."

NICHOLSON FILE COMPANY

Turn page for the BIG PAYOFF

Your Industrial Salesman will help you pick a winner from these Nicholson "stablemates"

Here are ten examples of Nicholson files that have been carefully "bred" to do specific jobs — and do them superlatively well. The right Nicholson file can reduce labor costs on your job because it works faster, and reduce tool costs because it lasts longer. Your Industrial Distributor's representative has specialized information on these thoroughbreds. When next he calls, be sure to ask him about care, selection and use of the right Nicholson file for your job.

ALUMINUM "A"

Tooth construction eliminates clogging and pinning of this "problem" metal. Shearing motion toward left gives smooth finish. Flat and Half Round shapes.

BRASS

Long overcut (diagonal teeth) and short upcut reduce clogging and improve traction on this slippery metal. Used with light pressure. Half Round.

LEAD FLOAT

Short-angle, single-cut teeth are virtually a series of stubby "blades" to shear away soft metals like lead, babbitt, copper. Light pressure produces smooth finish. Made in Flat and Half Round shapes.

STAINLESS STEEL

High chromium and nickel content of stainless steels wears out ordinary files quickly. These special Nicholson files, properly used, have exceptional work life. In all Regular Purpose shapes.

FOUNDRY

Husky, heavy-cut teeth resist breaking off against fins, sprues and other casting projections. Also used for filing sharp corners of dies. Flat and Half Round shapes.

DIE CAST

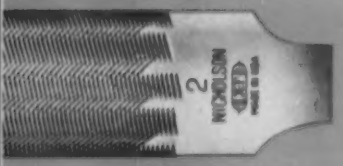
Extra-strong teeth resist breaking off against sharp corners or projections. Also reduce tendency to clog of magnesium, zinc, similar metals. Flat, Half Round.

SHEAR TOOTH

Designed for rapid removal of aluminum, copper, brass, similar metals. Leaves a very smooth finish. Use with slight diagonal stroke to right. Flat and Half Round shapes.

LONG ANGLE LATHE

Gives cleaner shearing and clearing, cuts faster than ordinary files. "Safe" (uncut) edges avoid damaging shoulder of work. Made in Flat shape only.



SWISS PATTERN

For close-tolerance filing of dies, patterns, instruments, etc., these fine "specialists" come in hundreds of shapes, cuts and sizes. Made in fine cuts to exact measurements.

SUPER SHEAR

Cuts and smooths in one fast operation. Practically two files in one! Also breaks up fillings, clears chips, files chatter-free. Made in Flat cross section only.

Specify Nicholson "thoroughbred" files on your next order to your Industrial Distributor

Write for FREE "FILE FILOSOPHY": widely used in industry as the textbook on files and filing.

NICHOLSON FILE COMPANY, PROVIDENCE, R. I.

(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)

NICHOLSON U.S.A.

BLACK DIAMOND U.S.A.

NICHOLSON and BLACK DIAMOND FILES

A FILE FOR EVERY PURPOSE

Electrical Discharge Machining

saved $448 sinking this forging die using Brass electrodes

Conventional Method

Mill Cavity (Man and Machine)	56 hours
Hand Finish (Experienced die sinker)	52 hours
TOTAL	108 hours

ELOX method

Forge Electrode (Man and machine)	2 hours
Set up and change electrodes (man and machine)	8 hours
Machine hours only (no operator required)	32 hours
Hand finish after E.D.M.	2 hours
TOTAL	44 hours

Saved: 64 hours at $7 per hour

additional EDM advantages in forge die machining:

- Dies are fully heat treated prior to machining thus eliminating possible distortion.
- Resizing forging dies after washout can be done within two hours.
- Inherent workhardening values are retained in the dies since no additional re-heat treating is necessary.
- Actual die life is increased.
- Many forge die alloys are self-polishing after EDM.

This machining application is one of many time and material saving jobs being turned out by the standard Elox M-500 Electronic Machine Tool. See EDM in operation at Elox Demonstration Centers.

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Elox Electron Drills for removing broken taps, drills, etc., from $495 to $3450.

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IRD Balance: *final dimension of precision*

For Grinding — Higher Production and Chatter-free Quality

IRD Analyzers did this for Timken Roller Bearing Company:

1. Cut unproductive downtime for wheel balancing by 600%.
2. Eliminated grinder chatter — no chatter rejects.
3. Decreased troubleshooting time by pinpointing *all* the causes of chatter.

What's more, in-place electronic wheel-balancing eliminated removing the grinding wheel from the machine — cutting wheel balancing time from 3 hours to less than 20 minutes. Not only do IRD Vibration Analyzers locate and correct trouble in grinding wheels, but in accessory components such as spindles, motors, belts, gears and hydraulic systems. The IRD Analyzers are portable for troubleshooting and in-place balancing... *at running speed*. Now, no grinding machine at Timken exceeds the permissible vibration tolerance of .000090 inches.

What IRD troubleshooting equipment is doing for Timken, it can do for your company's production equipment... for any machine tool, or for fans, pumps, motors, turbines, generators... machinery of *any* size that has rotating parts.

Why not have an IRD representative call on you to demonstrate the possibilities of obtaining IRD Balance—final dimension of precision—on your machines?

IRD vibration analyzers

International Research and Development Corp. | 802 Thomas Lane, Columbus, Ohio

schedule his day. There's one in every plant. His desk is piled high with unfinished business; he insists on reading and approving everything that even remotely concerns him; he is too busy to hear what you have to say and too busy to make considered decisions. Most of the time he is too busy to read how others are sovling the problems that consume so much time; too busy to see salesmen who often have good time-saving ideas; too busy to attend meetings. In fact, he is so busy being busy that he hasn't time to think.

You'll generally find that the foreman who is too busy to think is also too busy to take time to spell out what he wants a man to do. Then he flies into a rage when a subordinate, doing the best he can with the meager instructions given him, pulls a boner. If the foreman in a hurry had just paused a few minutes in his rush to nowhere, and had made sure the man understood what he said and what he meant, he might have saved himself a lot of time-consuming work. What good shop administration needs is more direction on the part of its foremen and less running around in all directions at once.

There is another variety of the too-busy foreman and he is the man who just can't find time to see salesmen. As a result, he is not up to date, as he should be, on new methods, new products, cheaper ways of doing things. Chances are he's costing the company plenty of money. But where the too-busy habit is especially expensive to a company is in the case of executives whose value

"Jipsom and I are carrying on the work in this department together. I do the work and he does the carrying on!"

is in direct proportion to their ability to create new ideas, develop better methods and keep things headed in the right direction. Obviously, if these foremen and executives insist on doing all sorts of petty tasks, they will not have time to read, to study what their competitors are doing, to develop any new ideas themselves.

There is much truth in the statement that if you want a thing done, find a busy man to do it. That means a man who knows how to organize his time. Too many foremen spend from two to four hours a day doing non-essential things. They do tasks which could easily, and perhaps better, be delegated to others or subordinates in the organization. The foreman could use his time better. He should sit down and figure out how to divide his time to the best advantage; how much for production, employee relations, paper work, supervision, etc.

The foreman should learn that he isn't indispensable to production. He shouldn't be afraid to take time off for something important when it comes up, such as attending special demonstrations of new equipment, or machinery and methods. The foreman is indeed derelict in his responsibilities to his company when he has reached the stage where he hesitates to delegate work to a subordinate and has so little reliance on his men that he feels he must be around them at all times. The majority of workers have a healthy degree of self-reliance and are sufficiently mature enough to solve most of their problems themselves. They will avoid going to the foreman with matters that are trifling and insignificant. It will be found that the men will solve most of their problems themselves, providing they don't always have somebody handy to lean on.

Lack of time is a chronic complaint of most foremen. Interruptions arise in the day's work, crises occur, appointments take longer than expected, and suddenly the day is gone with much of the work left undone. Therefore each foreman should check to see how much paperwork he can eliminate, simplify, or turn over to his subordinates, and devise a scheme whereby he isn't heckled with every little detail his men may feel he should answer.

Many foremen spend more time than they realize in answering trifling questions from workers who should know better. We are all acquainted with men who wax verbose over minor details, pestering the foreman and expecting him to hand down a carefully considered opinion

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H & F TURRET DRILL PAID FOR IN 6 MONTHS BY SAVINGS IN REJECTS ALONE

hf
TURRET DRILL CASE HISTORY No. 26

MANUFACTURER—Clifford Manufacturing Company, Waltham, Massachusetts

PART—Tellurium Copper Forging

FIXTURE—Single position, bolted to machine table

OPERATIONS

1. Load.
2. Combination center and countersink, 750 r.p.m. Index.
3. Rough drill .285 diameter, 550 r.p.m. Index.
4. Drill ⅛" diameter, .440 deep, 1450 r.p.m. Index.
5. Drill #53 .610 deep, 2875 r.p.m. Index.
6. Finish counterbore .285 diameter, .250 deep, 1000 r.p.m.
7. Unload and Clean.

Production Rate	On H&F Turret Drilling Machine	On Conventional Multiple Spindle Drill Press
Pieces per hour	30	16
Inspection	10%	100%
Rejects	1.5%	10%

Note that the H&F machine has increased production 87%, cut inspection time 90% and rejects 85%. As the parts are worth $12 each, the savings in rejects alone paid for the H&F machine in 6 months.

COMMENT With the H&F machine, each spindle works on a common axis and runs at an optimum preset speed to an accurate preset depth. • The work is correctly positioned for each operation by a fixture bolted to the machine table. • Production is substantially increased because no time is lost moving work from spindle to spindle or sharpening tools dulled by contact with jig bushings. • Rejects are virtually eliminated because correct spindle speeds and accurate alignment of tool and bushing produce straight holes with a good finish. • Let H&F save money for you. • Write for catalog and further time studies.

SEE US AT THE ASTE BOOTH NO. 575

HOWE & FANT, INC.

27 FITCH STREET, EAST NORWALK, CONN.

or order for varying phases of practice which really matter but little in the long run. If the foreman shows such individuals that he has set up a schedule that allocates his time, they will not be encouraged to run to him for solution of petty and picayune questions.

The foreman who admits he has no time to think is also admitting the fact that he probably has failed to take advantage of the talent, information, and know-how among his subordinates. The foreman should be what he is paid to be; an executive, able to delegate work, and schedule his time to allow for creative work, short cuts, and planning work improvements. You don't need statistics to prove that the "do-it-all-yourself" type of executive is in an untimely rush to self-extinction.

Harry Kaufman
Philadelphia, Penna

Once the situation is thought about, one can quickly see who is going to be promoted in this company. The man who keeps alert and abreast of current trends and conditions both in his own field and in the field of supervision is going to be ready for advancement.

Won't Ed be surprised when the opportunity comes and he is found wanting? He will probably be so busy with his little flock he will never recognize the chance until it is gone, and then watch the howl go up.

He will act maligned; the com-

"I haven't seen the foreman all day, either. Maybe it is Sunday!"

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Years of successful experience in special tooling and related production problems are yours for the asking. When the job requires special cutting tools call in your National Tool Co. representative. He is backed by more than 49 years experience in the engineering and manufacture of special cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

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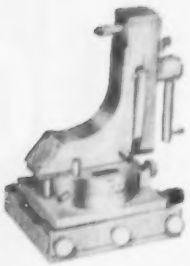
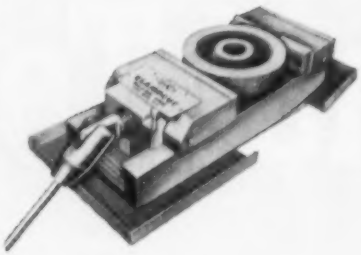
J&S DOWN-HOLDING DEVICES and WHEEL DRESSERS LEAD THE FIELD

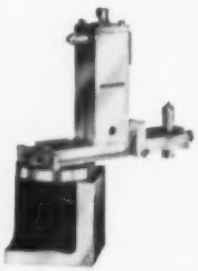


Fluidmotion Wheel Dressers—Dress two angles tangent to a radius, using ONE handle in one continuous motion. Operation is so fast and simple that beginners can use them. For all types cylindrical and surface grinders.



J & S Swivel Vise—The only hardened and ground swivel vise that mounts low, swivels, needs no pedestal. Patented down-holding clamping jaws give many times the holding power of an ordinary vise, yet only half the weight.

J & S All-Purpose Jaw Clamps — For any machine table or face plate. Five models—one adjusting screw has a holding force of 2½ tons on Small model, 12 tons on Jumbo model. Eliminate u-clamps, straps and fingers No obstruction problems, no interference with measuring tool readings.



J & S Form-Master—Sturdy wheel dresser for shops with less frequent wheel dresser requirements. High quality, 100% dust-proof, it is capable of dressing any radii up to 12″ convex, up to 15″ concave. Prices start at $45.00.

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pany will be accused of always picking men with less experience than he has, and a hundred other remarks common to many of us will be passed.

To many people the few minutes spent in learning how to do your job better is so much wasted time. In fact, many think the big boss would not condone it—that the company would frown on such action. This can be true in many companies where higher supervision is limited in their capacities to advance and to grow.

But take an organization which is alive and growing,—the feeling is that every member of the management team must be awake. Each man down to the foreman, and including this front-line individual, must be fully equipped to meet all emergencies. They must know their own job and also how others solve problems. Time to think comes from properly evaluating one's time in work.

To be a good foreman does not mean solving each little problem for a worker. Don't forget that if you try to do all the work yourself, that your employees will lean heavily upon you. One thing many people don't want to have or accept is responsibility. They want someone to think for them. Do you want someone to think for you? Does your boss hold your hand and do you ask him what to do next? If you do and if in turn, you try to tell each employee how to do his job eight hours a day and five days each week, then you have not learned to become an efficient foreman.

A foreman should not be an individual who is hard to get to, but neither should he be an easy mark

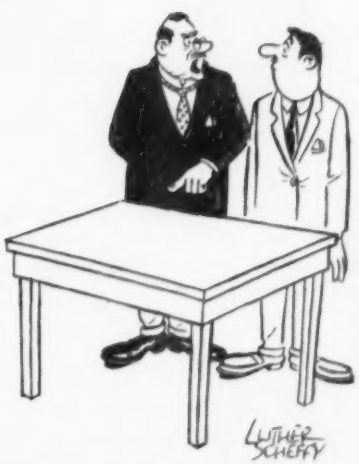
"I can't understand why you can't get along with the foreman—They're always very nice to me."

and solve all the little problems that his men should solve for themselves and are paid to do. He must learn that to listen is a prime requisite for his job, but to know how and when to help physically, or give an actual solution, is what makes the foreman capable of advancement.

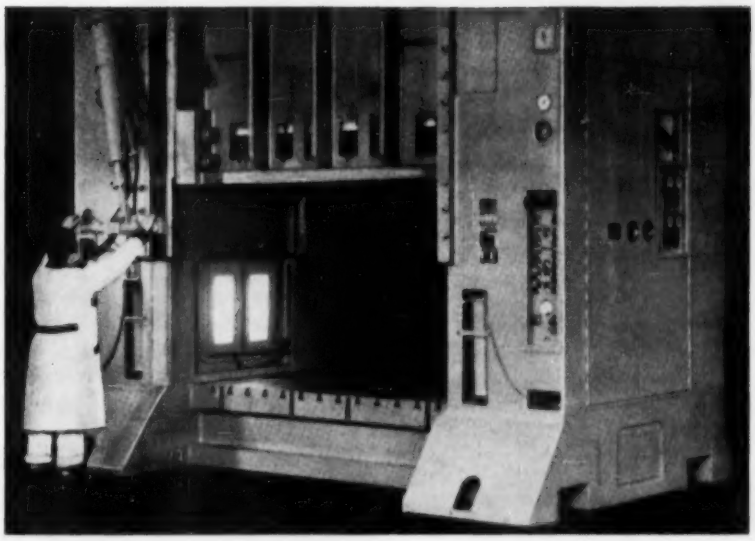
Charles D Townsend
West Hartford, Conn

Some foremen are actually afraid to let the men in their department take any initiative whatever for fear that management would quickly assume that the department could get along without the foreman's presence and put a clerk in his place to handle the reports, paper work and deliver the orders to the men. That type of foreman should know better; no modern shop would be able to operate for long at a profit with a management that was trying to reduce overhead by any such scheme. As a matter of fact a progressive management is favorably impressed by the foreman who develops a smooth-running shop that operates just as efficiently when he is away as when he is present, for that is foremanship at its best.

There was a certain foreman called Bill who was a quiet, unassuming fellow. At first the men got the idea that he really did not know a great deal about toolmaking because when he was giving out a new job he always asked the man how he thought it would be best to tackle the problem. He would listen with great interest as the man explained his proposed method. Sometimes Bill would say, "That's a good idea; go



"This miniaturization business has gone far enough! I can't see anything!"



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PRESSLITE UNITS are four lamp units for lighting the bed areas in presses. Units contain two specially designed instant-start ballasts. Lamps are single pin, cold cathode type for rough service. Lamp life under normal operating conditions is over 10,000 hours. Lamp shield is shatterproof Plexiglas, louvered for maximum eye comfort. Cord is No. 18/3 Neoprene, six feet long, terminating in a plug. For use on 110-118 V. 60 Cy. A.C. Body and cover made of 19 gauge steel. All joints and seams welded oil-tight to protect the lamps and internal wiring.

ILLUSTRATED four No. PL420 Presslite units installed on large forming press.

WRITE TODAY for bulletin No. 156 containing specifications and installation data.

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"Operations Kingsbury" The result is always

The simple operations performed by these two Kingsburys might lead one to ask: "Why use automatic drilling and tapping machines for this work?"

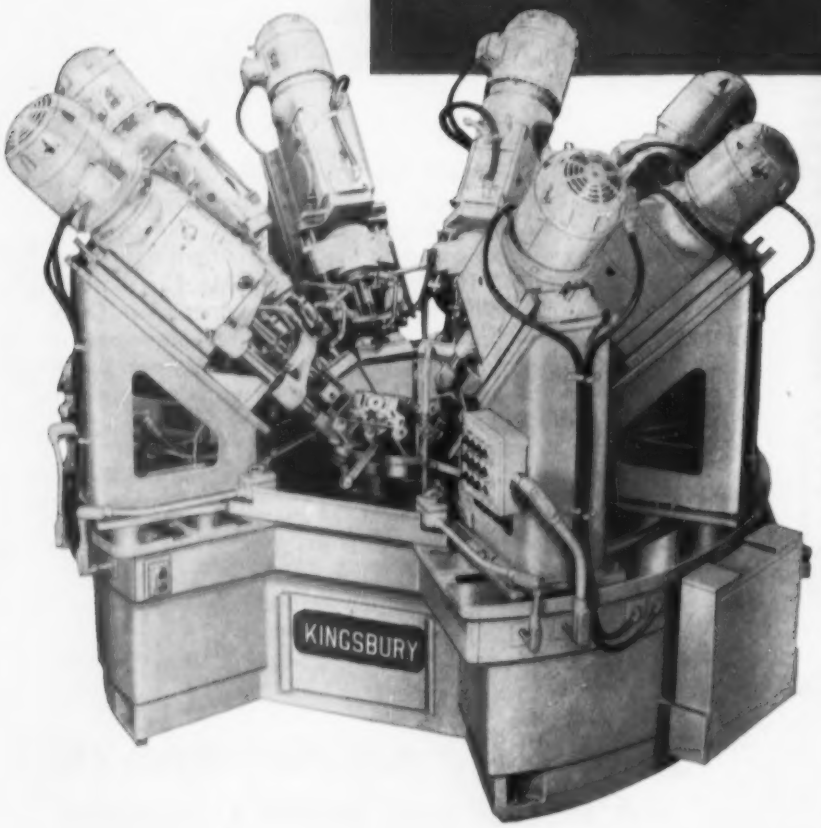
Let's take another look.

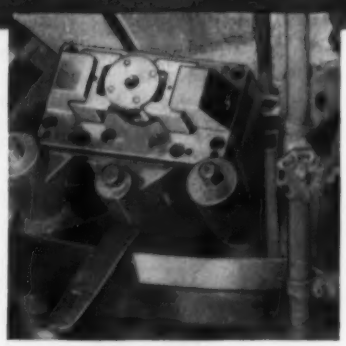
Notice that the two parts have several features in common. Each part is round. Each part has an axis hole which requires a chamfering operation at the "top." This operation prevented the use of any hold-down mechanism working on the top of the part. In the case of the Differential Bearing Support, the rim around the axis hole is too narrow. In the case of the Fan Hub, the top surface is wide enough, but specifications called for facing this surface.

So, in each case we used opposing jaws. These jaws grip the outside diameter and hold the part in a vise-like grip.

Fan Hub called for 17 tool operations — normally from two directions. We designed the machine with a 96-inch base and 26-inch table, indexing through eight stations — one for loading and unloading. Seven Kingsbury units are mounted on the base, each at an angle of 45°, and the parts are presented in the

FAN HUB — Steel
17 tool operations from one direction
272 parts per hour gross — 3 1/10 ¢ per part
FOUR HOLES 5/16 - 24 thds
STA. 2-A: Tap drill
STA. 3-A: C'sink
STA. 4-A: Tap
AXIS HOLE 6329/6402
STA. 1-A: Chamfer hole and face end
STA. 5-A: End ream
STA. 6-A: Finish ream
STA. 7-A: Burr





Fan Hub part is held with axis hole at 45°, flat side up. Two serrated jaws clamp the part just below the flat face. Bushings guide tools as required. Fixture is manually loaded and clamped; is automatically unclamped for manual unloading.

the same: interchangeable parts at low cost

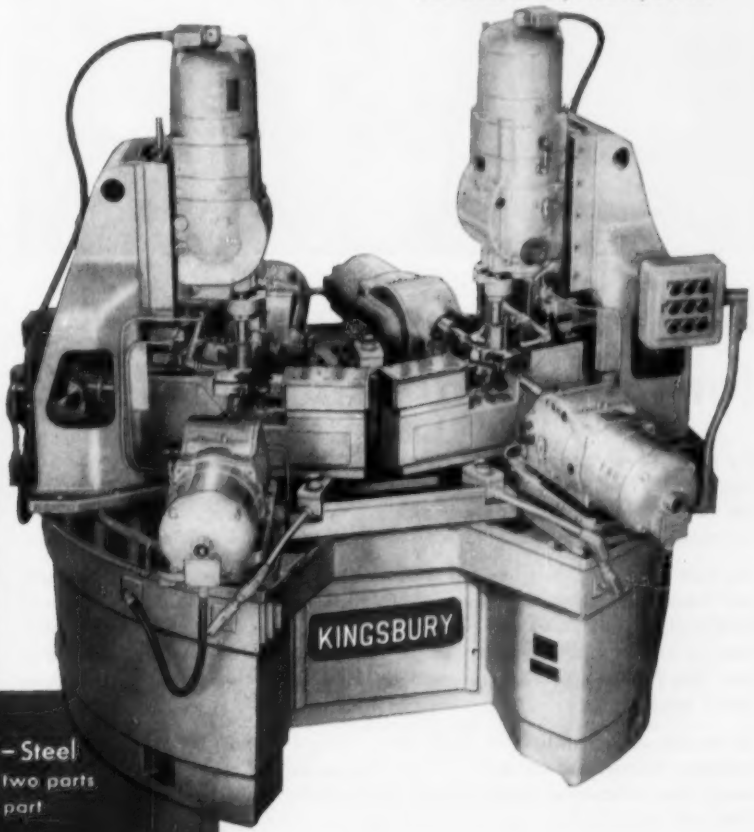
fixtures at this same angle. Fixtures are loaded and clamped manually — unclamped automatically.

All work is performed from one direction. At *Sta.* 1-A a combination tool faces the top surface and chamfers the axis hole. At *Stas.* 2-A, 3-A and 4-A the four holes are tap-drilled, countersunk, and tapped for 5/16-24 thread. Units at *Stas.* 5-A and 6-A end-ream and finish-ream the axis hole .6392/.6402 dia. To remove the burr on the back we use a recessing tool through the axis hole — at *Sta.* 7-A.

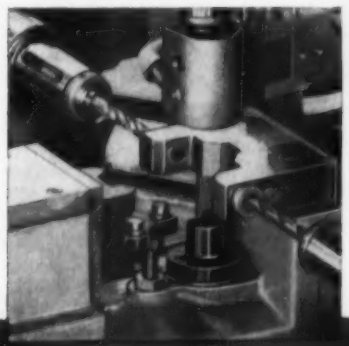
For the Differential Bearing Support we used an 80-inch base and two stationary work-holding fixtures, one at the left and the other at the right — actually two machines on one base. The part is placed in each fixture with the axis vertical, tapered end at top. The opposing jaws of the fixtures clamp and unclamp automatically. Horizontal front and back units are equipped with combination tools which drill and countersink the .3437 dia. holes. Vertical units chamfer the 1.48 dia. hole.

Why use a Kingsbury in each of these cases? For high output with low cost per part — *as usual.*

Kingsbury Machine Tool Corporation
117 Laurel St., Keene, N. H.



Differential Bearing Support part is held with axis hole vertical and tapered end at top. Two jaws (one fixed, one movable) clamp the part on the outside diameter. Bushings in the fixture guide the drills. Fixture clamps and unclamps automatically; loading is manual.



DIFFERENTIAL BEARING SUPPORT – Steel
Three operations from three directions on two parts
492 parts per hour gross — 1 7/10 ¢ per part

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Of course, all our installations are not as simple as this—in some cases, tremendous weights are involved, or vibration problems are critical, or both. In these cases production engineers are enthusiastic about Korfund Steel Spring Vibro-Isolators.

Solving vibration control and machinery mounting problems is Korfund's specialty. We have more than a half-century of experience in the field. Our experience lets us recommend "the right way the first time"—no trial-and-error basis is necessary.

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For specific recommendations contact us or one of the 46 local Korfund offices. Look under "Korfund" in your local Telephone Directory or in Thomas' Register.

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ahead," and the man would start on the job feeling that he really was better than his foreman. He would work on the job without a hitch for should any trouble develop he would solve it by himself without even thinking of asking the foreman for advice, because it was his own idea and he would not care to admit he was having any difficulty with it.

On the other hand, if the proposed plan of action did not suit Bill he would start asking questions and point out where over-tolerances could creep in or where difficult grinding or warping might develop. Pretty soon the toolmaker would have to admit to himself that the foreman really knew more about toolmaking than he had assumed, and in future he was going to be mighty careful not to talk and brag too fast. He was also very apt to make every effort to solve by himself any problem that came up rather than have to run to Bill and admit he was stuck.

Bill was also very considerate to any workman who innocently used poor judgment. For instance, there was Herman who was a very neat and tidy man. One of his early jobs was to make a sixteen-hole drilling jig for a cover plate of which there were 500 on order. The jig was to be kept for there would be more orders later as needed. The contract was for a minimum of 10,000 plates. Herman produced a fine looking jig, nicely machined all over, carefully smoothed, corners rounded, and equipped with a complete set of hardened bushings. Bill said it was a first-class job. A short time after this an order came in for another drilling jig for three holes in a total of 200 castings. Her-

"Anybody can collect stamps."

man was given the job without any comment and was laying it out exactly the same as before when Bill happened to pass by, saw what Herman was doing, and stopped him. "No bushings," Bill said, "also use mild steel, case harden, grind off fins from saw cuts and sharp corners; no base—just a clamp to hold it in place on top of casting."

Herman felt hurt: "But—but—" he stammered, "you said the last jig was first-class—now you're objecting to the same thing."

"Look Herman," Bill said, "the first jig has to accurately guide the drills for thousands of close tolerance holes; it has to last for years and it must be handled carefully. The bushings provide for accurate and economical replacements as soon as they wear to the tolerance limit. The nicely machined surfaces and trimmed edges indicate it is a very important piece of equipment and anyone handling it will naturally be careful not to put it where it may get damaged or wet and rusted; it is properly adapted to fully accomplish its mission. This second jig will be used once and then scrapped. It must be accurate within the tolerance limits but that is all; the cheapest arrangement that will accomplish this is what is wanted, and any fancy trimmings, polishing, or unnecessary bushings marks its maker as lacking in the knowledge of the first principles of toolmaking."

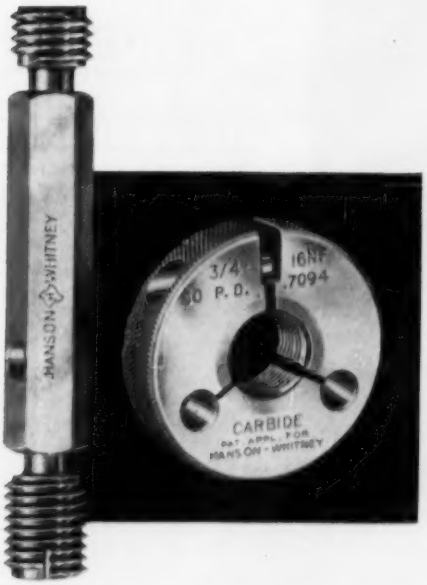
"Gee, thanks," said Herman. "I've learned some real valuable dope in the last few minutes."

George P Pearce
Albuquerque, N M

Toolmaking versus production work—a topic for dispute and discussion since Eli Whitney started interchangeable manufacture. This is one of those cases where the other fellow's problems seem smaller than your own.

The toolroom man cannot see why the foreman in the production shop should have to answer questions presented by the people in his department. After all, how many questions can a man ask about an operation that he performs day after day? He should have thought up and asked all the questions during his first few days on the job.

To the toolroom man production work is a dream—just set up the machine, put a man on it, and watch the work roll out. Of course it is never that easy; there is always tool breakage and machine downtime. There are those special rush jobs



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Ellstrom Standards are now produced and unconditionally guaranteed to specified millionths well within the following improved gage block tolerances:

"W" Working Accuracy Blocks: +.000008", −.000002" per inch of length, with flatness and parallelism held within .000006".

"I" Inspection Accuracy Blocks: +.000004", −.000002" per inch of length, with flatness and parallelism held within .000004".

In addition to providing finer accuracy at no increase in price, these Ellstrom Standards also give you up to 75% longer wear life. For, by reducing the allowable "minus" deviation, you get an additional guaranteed wear allowance of from 2 to 6 millionths of an inch, as compared to common industry standards, before the blocks need be considered worn undersize.

Ellstrom Standards are furnished in 28 basic sets of from 8 to 92 blocks in both rectangular and square styles. Individual blocks are also available in sizes ranging from .010" to and including 20.000" to meet your particular needs. Send for complete specifications and prices today!

Set No. 35-R: "W"—$195.00; "I"—$280.50

Set No. 81-SA: "W"—$545.00; "I"—$784.35

ELLSTROM STANDARDS DIVISION
DEARBORN GAGE COMPANY
"Measuring in Millionths for Three Generations"
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- Ellstrom Master Sine Bar "W" Accuracy: $112.50 "I" Accuracy: $152.75

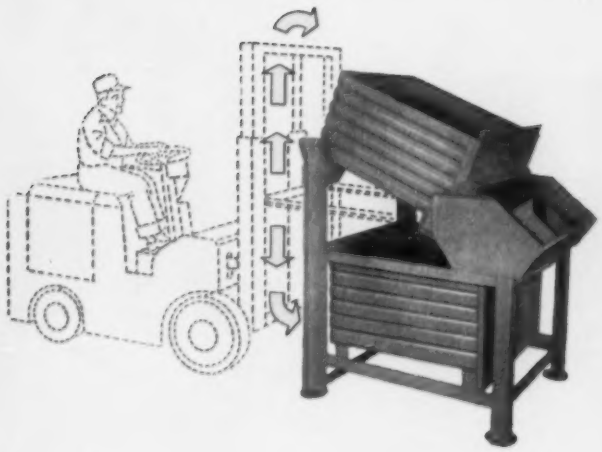
which mean breaking the setup. There are those warped or out-of-size castings that will not fit in the jig. There is the ever-present problem of spoiled work, and rework. Sure, a modern production machine can turn out a lot of work, but it can use up expensive stock just as fast making defective parts as making good pieces.

The problems of the toolroom foreman are equally severe and pressing even if they are of a different nature. The men in the toolroom are more skillful, but the work is more difficult, and there are always one or more questions to be answered. One extra pass under the grinding wheel can convert an expensive piercing punch to scrap. A moment of carelessness can mean a broken tap and hours spent in chopping out the pieces or making a new part.

Everybody in the shop faces some problems; a foreman in any department faces a great many each day. The foreman is responsible for many things and must allocate his time to each item in accordance with its importance. It is seldom indeed that any person in a supervisory position finds himself with time on his hands. The foreman must stay close to his job and be alert and attentive to all the details. He must pay heed to them for he is responsible for them.

Answering the questions of the men in his group is just one of the chores which must be done, and it is an important one. It is important because it represents a problem that the man is working on at the moment. No answer or an incorrect answer can mean lost production time. The right answer promptly given means a minimum interruption and delay. These questions also represent an opportunity for the foreman to give the employee a little instruction and advice on the

"On the other hand, there are some things that automation just can't replace."



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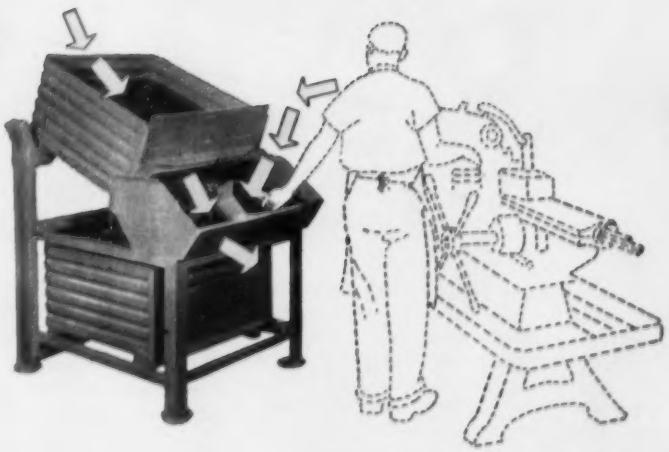

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*Illustrated above: Typical Perkins custom-made gear

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matter at hand. The foreman should recognize the necessity for these questions and should show it by giving a prompt and complete answer. In this way he will encourage the men to bring their problems to him rather than just waiting for him to come to their assistance, or turning out incorrect or poor work.

Clifford Malloy
Bronx, N Y

New Books . . .

INVESTMENT CASTINGS — HOW MUCH DO THEY COST? — *Engineered Precision Casting Co, Box 68, Matewan, NJ. Price $1.*

Here is an easy method of evaluating approximate cost of parts to be produced by the investment casting process. It is illustrated and graphed in three colors.

•

SUPPLEMENTARY LIST OF BOOKS AND PAMPHLETS IN SPECIAL LIBRARY OF INDUSTRIAL DIAMOND INFORMATION BUREAU—*Published by Industrial Distributors (Sales) Ltd, 32-34 Holborn Viaduct, London EC 1, England. 64 pages, 5½ x 8¼ in. Available without charge.*

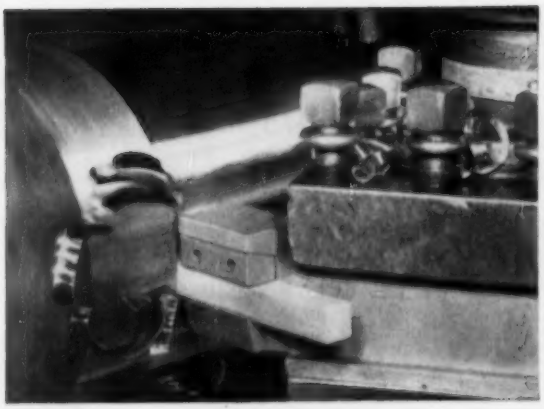
In 1952 the publisher issued a complete list of books and pamphlets in his library. This supplement is intended to bring that list up to date. In addition to normal listings there are appendices giving new reports of investigations and information circulars of the US Bureau of Mines, reports of wartime agencies, and a list of Russian books and translations available.

•

PREVENTIVE MAINTENANCE OF ELECTRICAL EQUIPMENT—*By Charles I Hubert, United States Merchant Marine Academy, Kings Point, N Y. Published by McGraw-Hill Publishing Co, 330 W 42nd St, New York 36, N Y 214 pages. Price $4.*

This is really a handbook, though printed on good paper and between hard covers like a textbook. It has three sections; one on preventive maintenance, one on trouble-shooting, and a third on operating techniques

Facts about DIAMONITE OXIDE CUTTING TOOLS



Stroboscopic photo taken at 1/1000 second showing standard Diamonite turning tool cutting A.I.S.I. 4140 steel heat treated to 275/300 Brinell, at 738 surface feet with .0138" feed and 3/16" depth of cut.

Because of the wide interest and rather limited information presently available on oxide, or so-called "ceramic" cutting tools, we are offering a few observations based on our experience of more than thirteen years in the manufacture and use of tools of this type.

First, it should be understood that there is nothing mysterious about these tools; the pattern of their development followed sound principles of tool improvement.

It goes without saying that, as hardness and wear-resistance of tool materials is increased, speed of material removal can be stepped up. Hence, tool makers have constantly sought harder, more wear-resistant materials.

The Bond, the Key to Tool Efficiency

Given sufficiently hard materials to start with, the determining factor of tool life and efficiency is the bond which holds them together. When pressures or temperatures reach a point where the bond fails, the tool breaks down. So attention is focused on strengthening the bond.

Some idea of what has been accomplished in the development of Diamonite Cutting Tools may be gained by drawing an analogy with the familiar sugar loaf. A sugar loaf is a small rectangular block made up of sugar crystals bonded together by starch adhesives or their own juice. Conceivably, it might be used as a cutting tool to "machine" material softer than the sugar crystals, but tool life would be poor due to the weakness of the bond. If a much stronger bond were used, speeds and feeds might be increased and harder material machined until the sugar crystals themselves failed. Then, if a harder, more wear-resistant crystalline material were substituted for the sugar, still harder materials might be machined and the material removal rate stepped up provided the bond possessed sufficient strength.

What Diamonite Is

Diamonite may be described as a crystalline substance possessing hardness and wear-resistance greatly in excess of that of other materials commercially used in cutting tools, held together by a non-metallic vitreous bond, highly resistant to heat and developing strength at elevated temperatures far greater than that attainable in metallic bonded materials.

Being composed of specially-prepared crystals of aluminum oxide, the hardness of Diamonite approaches that of the diamond. However, the true measure of its effectiveness in cutting tool service is the amazing strength of the bond, created by the patented Diamonite process for supporting these hard, wear-resisting crystals.

Characteristics of Diamonite Tools

Due to the great hardness and heat resistance of Diamonite, it is possible to use Diamonite tools at surface speeds many times those attainable with tools presently in use, at the same time maintaining excellent tool life. Because of its rigidity and the fact that, being non-metallic, it will not weld to metals, tools of Diamonite produce a fine finish approaching that of a ground surface.

Diamonite cutting tools were developed by us in 1943 to machine hard, highly-abrasive high alumina ceramics for the wartime electronics industry, following failure of all other tool materials including cemented carbides and natural sapphire. They have been in constant use for this purpose for thirteen years, affording opportunities for close observance of their performance and for bringing them to their present high efficiency.

Compared with other tools, Diamonite tools have low thermal conductivity and great resistance to high temperatures and thermal shock. Cutting edges retain their properties at extremely high temperatures and tools remain cool at ultra-high cutting speeds without the use of coolants.

Being chemically inert, non-oxidizing, non-magnetic and a non-conductor of electricity, Diamonite tools will not rust, burn or decompose; will not contaminate materials used for electrical or dielectric insulation and eliminate chip removal difficulties when machining magnetic materials. These tools have uniform characteristics all the way through and will not craze, crack or break off due to varying co-efficients of expansion of dissimilar materials or poor bonding.

About Speeds and Feeds

Diamonite Cutting Tools may be used for machining all metals and their alloys, plastics and abrasive materials, including ceramics and graphitic products, at speeds never before possible, multiplying the rate of material removal many times that possible with other tools. They work best at high speeds with conventional feeds, but heavier feeds are possible where power is available and equipment will stand the strain. The rate of material removal begins about the top limit for current high-production cutting tools and can be extended far beyond this point through the use of more powerful and rigid machines.

Diamonite Tools are now being used in production operations and re-orders indicate their performance has been equal to the claims made for them. Although complete re-design of machines may ultimately be necessary to realize their full potential, experience has shown that there are many operations on which they can be used to advantage on existing equipment.

Diamonite Cutting Tools are currently being manufactured in the form of rectangular blanks, standard turning tools, standard mechanically held 1½-inch inserts and "throw-away" lozenges in the four common shapes. Sizes and prices, together with suggested tool geometry and hints for best machining practice with Diamonite tools are given in a recently published catalog and handbook which may be obtained from

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WHAT'S THE
BEST WAY TO STRIP
METAL PARTS
IN LARGE VOLUME?
See page 9

Are you looking for better methods for stripping paint?

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¶ What's the best way to strip paint from metal parts too large to be soaked in tanks? *See page 3.*

¶ What's the best way to strip large areas of structural metal where a steam supply is available? *See page 5.* Where steam is not available? *See page 7.*

¶ What are the best ways to prepare stripped metal for repainting? *See page 11.*

¶ What strippers are best for removing oil-base paints?... Synthetic enamels, alkali-resistant plastics or resin-based paints?... Japans, wrinkle finishes, nitrocellulose lacquers, alkyds, phenolics and ureas? *See page 12.*

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that contribute toward good maintenance. There is also a section on identifying electrical apparatus, with photos, and an appendix with charts, formulas, symbols, and much other standard electrical data.

Preventive maintenance of electrical equipment is defined as the testing, cleaning, drying, varnishing, adjusting, and lubricating of electrical apparatus. The author gives a good deal of information about insulation, motor parts, controllers, and bearings. Recommendations are mainly on a practical level.

The trouble-shooting section shows how to test and repair motor parts and other apparatus. The operation section covers hookups and standard industrial practice. The author uses American Standards Assn, AIEE, and NEMA routines and recommendations where possible.

There are questions for classwork, first-aid hints, charts to guide the operator in trouble-shooting, and charts of standard data—like allowable currents for copper conductors of various sizes.

•

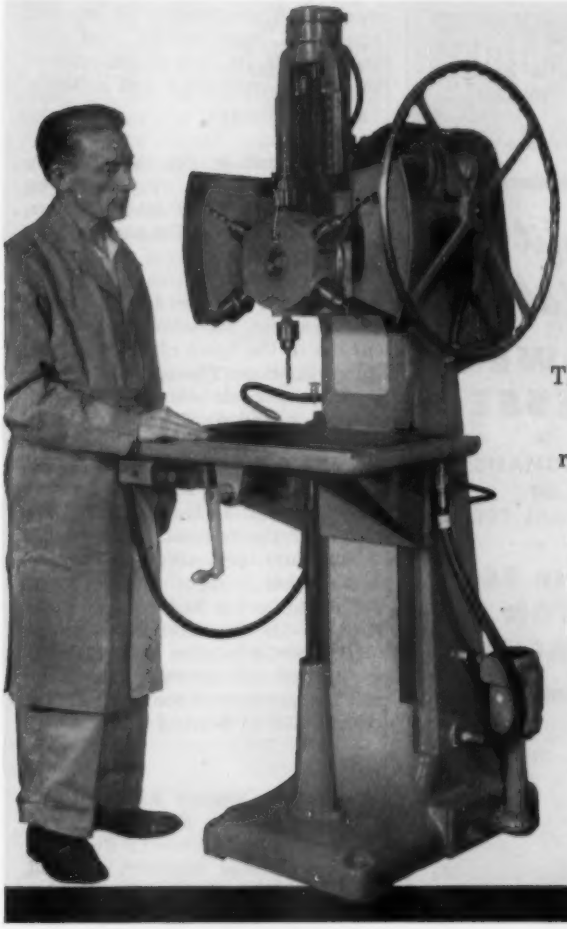
CODE FOR PRESSURE PIPING—*American Standard B 31.1—1955. Published by the American Society of Mechanical Engineers, 29 West 39th St, New York 18, NY. 136 pages, 8½ x 11 in. Paper bound. Price $3.50.*

Extensive revisions have been made in codes for pressure piping in recent years—gas and air piping for industrial and transmission systems, refinery and oil transportation systems, district heating piping systems, and refrigeration piping. These have now been brought together with numerous appendices to the several documents. One section on fabrication details is the most extensively revised.

•

INFRAREDS—A LIBRARY OF CONGRESS BIBLIOGRAPHY, PB 111643. *Published by the Office of Technical Services, US Dep't of Commerce, Washington 25, DC. 374 pages. Price $3.00.*

Compiled by the Library of Congress under a contract from the Office of Naval Research, this bibliography includes all references to published literature on the subject from 1935 to 1951 that could be found by a systematic search of available sources. Classification proceeds from infrared theory and general infrared-optical properties, through the various ele-



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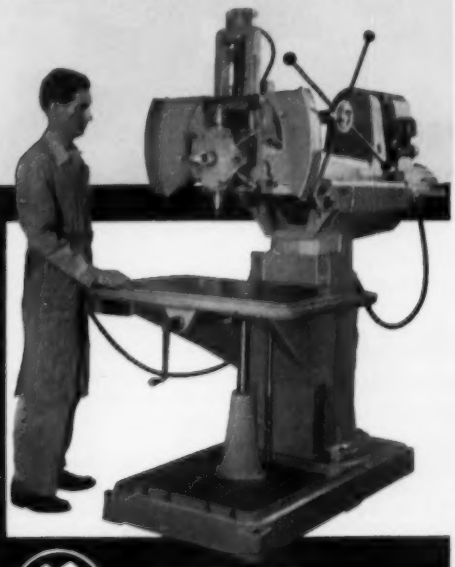

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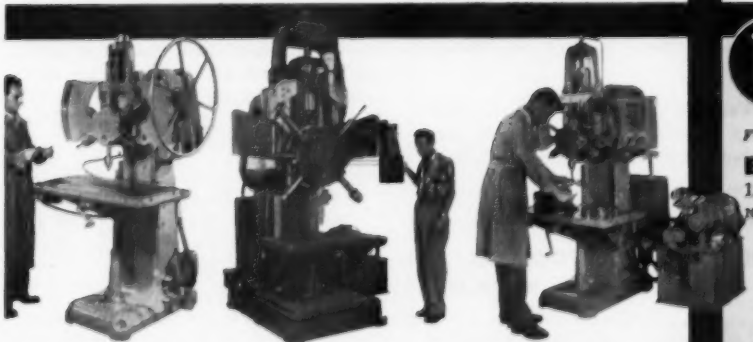

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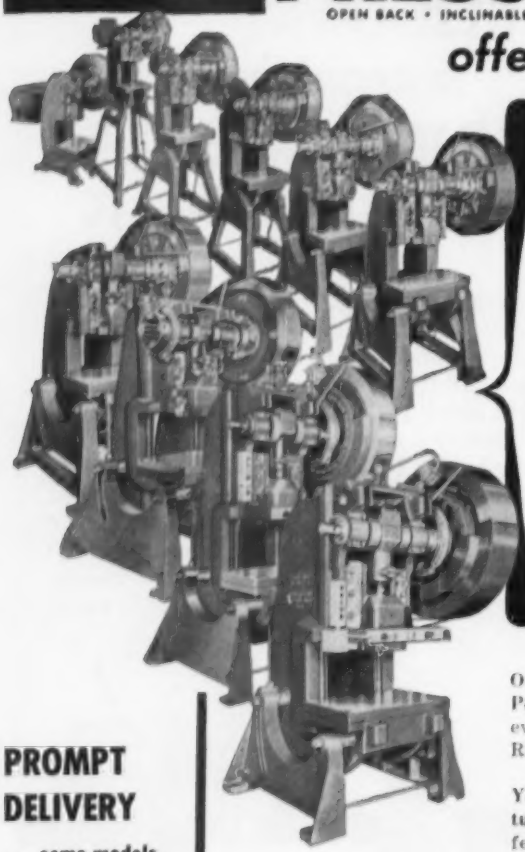

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BALL BEARING MAINTENANCE — *By Johnny Riddle. Published by University of Oklahoma Press, Norman, Okla. 170 pages. Price $6.00.*

This volume, intended for the user of ball bearings, includes a basic discussion of the types of bearings and their variations. The major emphasis is on proper methods of handling, mounting, and disassembly, and on the care of bearings. Many drawings are included to illustrate the points.

Photographs are shown of bearing failures with a discussion of the cause for the failures. The duplex bearing and "preloading" is covered in a chapter.

The author has had ten years' experience in the bearing industry, most recently in sales work. He has given thorough coverage to the subject and produced a book that should be of value to bearing users.

•

REVIEW OF CURRENT RESEARCH AND DIRECTORY OF MEMBER INSTITUTIONS — *Published by Engineering College Research Council, New York University, University Heights, New York 53, NY. 352 pages, 9 x 6. Price $2.*

Virtually every engineering college is engaged in some form of research, the results of which may be of great value to industry. This biennial publication lists all the members of the American Society for Engineering Education, gives the names of key personnel involved in research, and details the various projects now active or scheduled before 1956. In addition, it presents an index of some 5000 research project subjects, outlines the policies which govern research projects and contracts, and gives the annual expenditures and sources of income for research.

•

SHOP MATHEMATICS — *By Claude E Stout. Published by John Wiley & Sons, Inc, New York 16, N Y. 282 pages, 6 x 8½ in. Hard cloth bound. Price $3.70.*

This textbook concentrates on principles, particularly as they apply to problems that confront the shop man on his job. The book has been arranged in four parts to meet the

needs of a training program for machinists, tool and die makers, and pattern makers. Aim of the text is to present basic mathematical principles, and then to apply these principles in situations that confront the craftsman. Basic principles from arithmetic, algebra, geometry, trigonometry, logarithms, and slide rule, as well as their application, are included. Emphasis upon accuracy of computations is stressed throughout. Methods of checking most operations are given.

•

MECHANICAL WORLD YEAR BOOK 1956 —*Published by Emmott & Co Ltd, 31 King Street West, Manchester 3, England. 616 pages, 4 x 6. Price 4/6 (65¢).*

A completely new section on gas turbines is the major change in this year's edition. The earlier section provided a fundamental thermodynamic approach; the new section gives a more advanced account of current practice and deals with data and detailed methods for designing the principal components.

Additions and revisions have also been made in some other sections and tables.

•

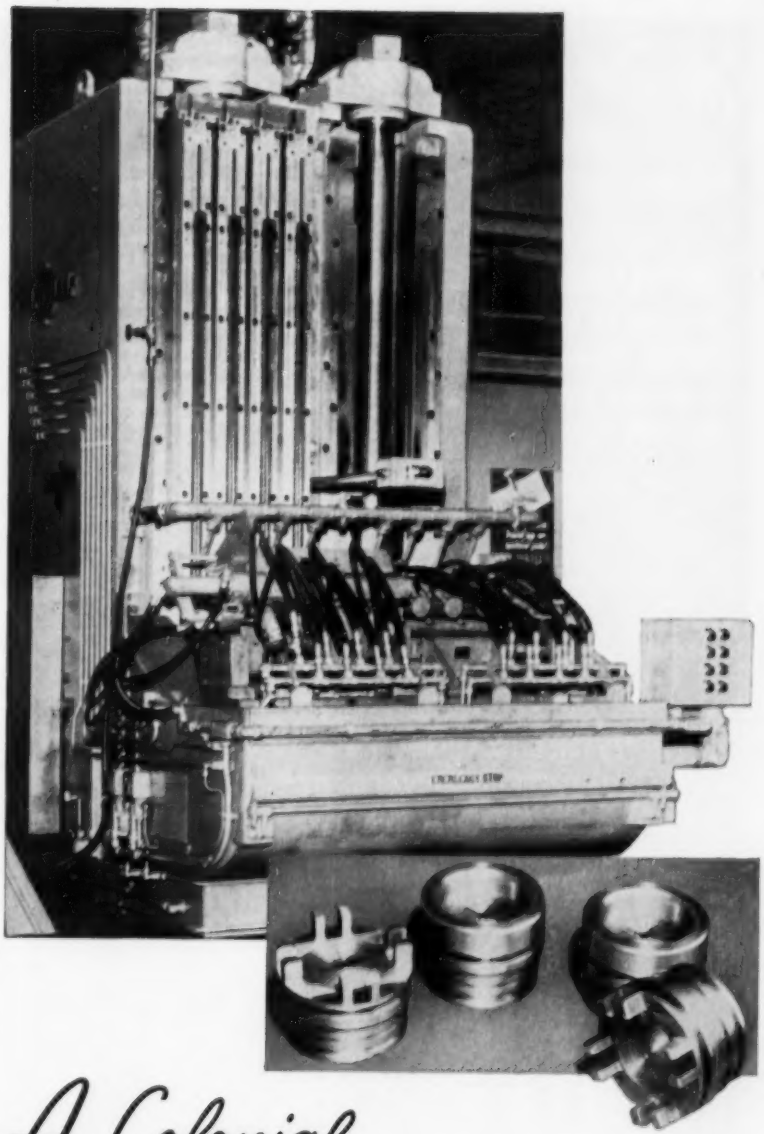
X-RAY PROTECTION—*Published by Nat'l Bureau of Standards, Washington 25, DC. 41 pages. Price 20¢. Order from Government Printing Office, Washington 25, DC.*

With the rapidly growing use of X-rays in industrial plants, the protection of personnel against radiation assumes a highly important role. This handbook recommends standards of safety for protecting workers and the public, and covers working conditions, survey and inspection of installations, and planning an X-ray installation. Structural details of protective barriers are given, together with maximum permissible weekly radiation doses, and changes in equipment design. Additional rules are also given for certain specific applications.

•

STANDARDS FOR THE INSTALLATION OF SPRINKLER SYSTEMS—*Published by National Fire Protective Ass'n, 60 Batterymarch St, Boston 10, Mass. 162 pages. Price $1.*

Designated NFPA No. 13, this revised standard has been officially adopted by NFPA. It applies only to the spray-type sprinkler, inasmuch



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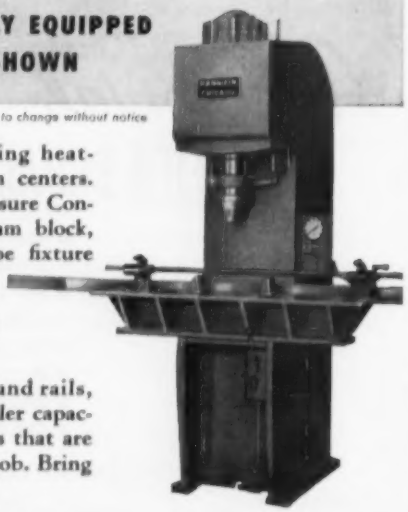

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as this is the only type now in production. Exception is made in the case of sprinklers for fur storage vaults which still use old-style sprinklers, and for which tests with spray sprinklers have not yet been made.

General information is presented on classification of buildings according to their fire hazards, preparation of buildings before sprinkler installation, water supplies and connections, and recommendations for piping, valves and fittings, location of heads, and similar matters. Also included are data on sprinkler temperature ratings, dry-pipe and preaction systems, alarms, outside sprinklers for protection against exposure fires, and spacing rules.

•

HIGH VACUUM TECHNIQUE—By J Yarwood, *head, Dep't of Mathematics & Physics, London Polytechnic. Published by John Wiley & Sons, Inc, 440 Fourth Ave, New York 16. 208 pages. Price $5.50*

This is the third edition of a book that covers the reasons why and the methods by which vacuum is used industrially, and the theory behind these applications.

New in the third edition are sections on the gas balance pump, large diffusion pumps and systems, new pump fluids, new materials, new valve designs, leak hunting, low-pressure measurement, and ultra-high vacuum.

The author covers equipment made in both England and this country.

•

DAS GENAUIGKEITSWESEN IN DER TECHNISCHEN NORMUNG (THE ACCURACY FACTOR IN TECHNICAL STANDARDIZATION) — *by Dr Ing Johannes Ickert. Published by Springer-Verlag, Reichpietschufer 20, Berlin W 35, Germany. 99 pages, 5½ x 8. Paper cover. Price DM 8.40 (Approx $2).*

Written at the instigation of the well-known pioneer of German standardization, Prof Dr-Ing O Kienzle, this book seeks to determine to what extent the principles and methods which have proved successful in certain specialized fields could be applied to industry in general when establishing maximum permissible tolerances.

The author analyzes the influence of close tolerance on production and inspection whenever complete interchangeability is required and, in

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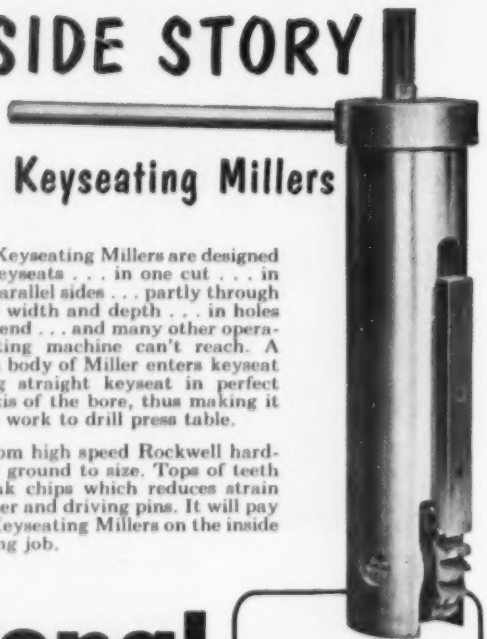
Our many years of pioneering and successful production of Nylon Gears, plus new reduced mold charges, can now make even greater economies for you in the use of Nylon Gears. With the great variety in molds now possible, Nylon should not only be considered as an economy measure but the answer to many problems where a compact design is necessary. Nylon Gears are quiet, durable, efficient and need less lubrication – they mate perfectly with metal gears.

Let our engineers with more than a decade in gear experience show you how Nylon Gears can save you money – let us consider your gear problems during the design process—send blueprints or specs for prompt estimates.

105

PROCESS GEAR CO., INC.
4614 W. Fullerton • Chicago 39, Illinois

The INSIDE STORY
about
NATIONAL Keyseating Millers



NATIONAL Keyseating Millers are designed for milling internal keyseats . . . in one cut . . . in offset holes . . . with parallel sides . . . partly through holes . . . of standard width and depth . . . in holes that are closed at one end . . . and many other operations that a keyseating machine can't reach. A demountable guide on body of Miller enters keyseat being milled assuring straight keyseat in perfect alignment with the axis of the bore, thus making it unnecessary to clamp work to drill press table.

CUTTERS are made from high speed Rockwell hardened steel, accurately ground to size. Tops of teeth are staggered to break chips which reduces strain and wear on both cutter and driving pins. It will pay you to put National Keyseating Millers on the inside of your next keyseating job.

national
MACHINE TOOL CO.
CINCINNATI 22, OHIO

WRITE TODAY
for Catalog No. 17
complete, handy size

conclusion, considers their application in connection with the ISA system widely used in Europe.

Reviewed by Erik H Delling

•

MECHANICAL WORLD ELECTRICAL YEAR BOOK—*Published by Emmott & Co Ltd, 31 King Street, Manchester 3, England. 300 pages, 4 x 6. Price 3/6 (50¢).*

The most important change in this year's edition is the inclusion of a new section which presents a concise account of electronic fundamentals and methods, and illustrates these by reference to the more appropriate applications.

New material has also been added on circuits and dimming arrangements for quick-start fluorescent lamps.

•

FREEHAND SKETCHING—*By J W Giachino and Henry J Beukema, Western Michigan College of Education. Published by American Technical Society, 848 E 58th St, Chicago 37, Ill. 94 pages. Paper covered. Price $1.65.*

Rough sketches are often important in shop operations. They help convey ideas that are difficult to explain, and are therefore valuable if used effectively. This booklet covers the fundamentals in learning how to sketch, and could be useful to many shop people as well as high-school students and hobbyists.

It includes material on how to draw accurate freehand lines, lettering, multiple views, auxiliary views, pictorial sketching, and shading. There are plenty of sketched examples, and considerable blank and grid space is included for practicing and copying. Most of the examples are of machine parts, so the book has a definite shop flavor.

•

FBI REGISTER OF BRITISH MANUFACTURERS — 1956 (28TH EDITION). *Published by Kelly's Directories Ltd and Iliffe & Sons Ltd, Dorset House, Stamford St, London S.E.1, England. 1110 pages 7½ x 9½. Price 42s 0d ($5.88).*

This comprehensive guide to a substantial cross-section of British industry lists the products and services of over 7000 member companies under more than 5000 alphabetical headings. For foreign users, there

(Continued on page 378)

FIELD REPORT: NO. 90

WHICH DIE STEEL WOULD YOU USE HERE to get this punch out of hardening in one piece?

This punch blanks automotive stampings from SAE 1010 strip, .062" thick. It is so unbalanced in design that safety in hardening is vital in the die steel used. Since the punch is shear fitted to the die section before heat treating, accuracy in hardening is equally important. The punch is hardened to Rockwell C-61/62. All the steels tried either broke or changed size excessively.

If the decision were squarely in your lap, which die steel would you be willing to recommend?

Here's how the manufacturer solved the problem, as recorded in a Field Report from our customer: The Carpenter Matched Set Method showed that Carpenter VEGA (Air-Tough) Die Steel had the hardening safety and accuracy plus toughness demanded by the job. The punches are now coming through heat treatment "right on the nose," and production between grinds has jumped from about 10,000 to 50,000 parts. Further, the heat treater says VEGA is the easiest air-hardening steel he has ever worked with.

When the decision is up to you, rely on Carpenter for *dependable* results. For fast attention to your orders, call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor, today. *The Carpenter Steel Co., 109 W. Bern St., Reading, Pa.*

Your toolroom can use Carpenter Matched Tool and Die Steels to:

Reduce hardening hazards
Minimize machine downtime
Boost output per grind
Improve product quality

Carpenter STEEL

Matched Tool and Die Steels

IMMEDIATE DELIVERY from local warehouse stocks — Export Address: Port Washington, N. Y. — "CARSTEELCO"

E. F.* makes BAY STATE

BAY STATE
BY-PRODUCTS CO., WESTBORO, MASS.

ELECTRONIC FORMULATION

* "E.F." is the latest "Wheels of Progress" development. Send for your copy of this illustrated descriptive booklet.

Grinding Wheels BETTER!

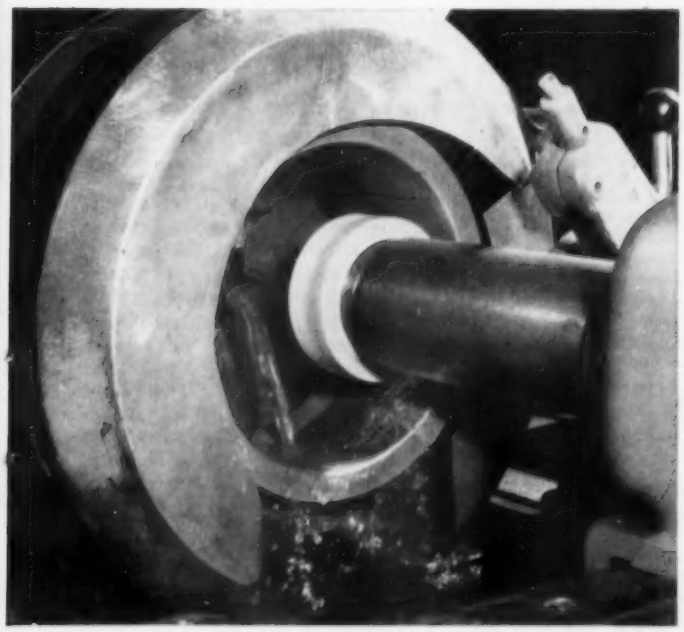
"Electronic Formulation" is the first use of an electronic "brain" for flawless calculation of grinding wheel ingredients. Its precision is unmatched in the industry.

"EF" GIVES YOU SUPERIOR ACCURACY IN:

★ **SPECIFICATION . . .** When your grinding requirements are analyzed, BAY STATE abrasive engineers have the industry's sharpest specifying tool. "EF's" equal-step, straight-line progression of grade and structure makes this new degree of accuracy practical.

★ **MANUFACTURING . . .** When wheels are made to meet your requirements, each ingredient is determined to the millionth of a pound! The 160 calculations per order are automatically self-checked. You can be certain that the ingredients of your wheels are exactly as prescribed.

★ **DUPLICATION . . . . .** When you reorder BAY STATE wheels, the perfect "memory" of electronically punched cards assures absolute accuracy in duplicating . . . and faster order processing too.



"EF" brings new dependability and accuracy to all precision grinding, such as this critical internal operation.

For full engineering benefits from this latest "Wheels of Progress" development, call in your local BAY STATE DISTRIBUTOR.

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Branch Offices and Warehouses — Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh
Distributors — All principal cities
In Canada:
Bay State Abrasive Products Co. (Canada) Ltd., Brantford, Ont.

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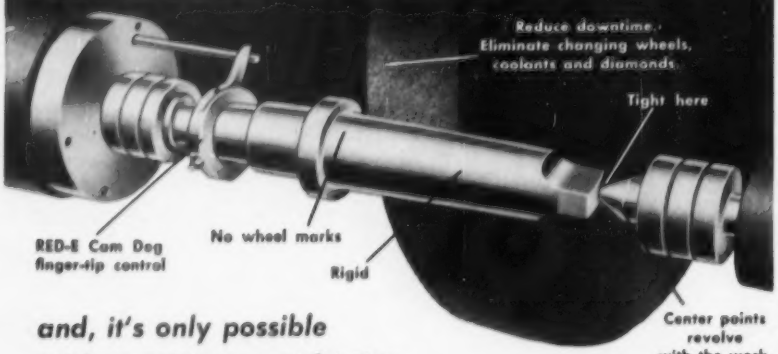
WHEELS of PROGRESS

Accuracy: to less than 50 millionths —

MAN... THAT'S MICRO-FINISH!



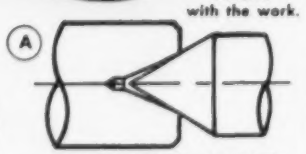
and, it's only possible with precision, anti-friction

RED-E GRINDER CENTERS

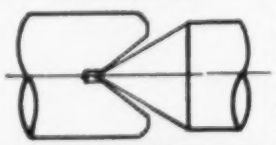
Chatter, wheel marks and out-of-roundness is caused by looseness in the center hole. The center and workpiece must be integral . . . rigid; the point in contact with the largest periphery of the centerhole, as illustrated in (a). Likewise, the bearing assembly must be able to provide great radial and thrust load capacities, with a minimum deflection under continuous operation.

If you're using anything but RED-E it's costing you money and you're not getting micro-finish!

Help yourself to super finishes. Read the new RED-E booklet "A New Concept In The Art of Grinding." Ask your Industrial Distributor for a copy today, or write direct.

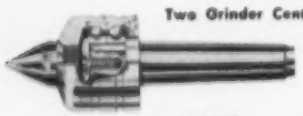


CORRECT CENTER CONTACT

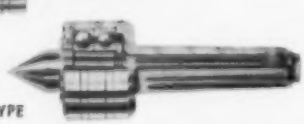


INCORRECT CENTER CONTACT

Two Grinder Center Types



SHANK TYPE



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1. Bearing assemblies are locked in, Duplex ABEC-7 spec, Precision, Preloaded, Angular Contact New Departure ball bearings.
2. Points are of High Speed Steel, ground 60 degrees, 30 minutes included angle.
3. Lubricated for life.
4. Labyrinth enclosure keeps out all coolants.
5. Guaranteed.

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SHANK	1 to 6	5 to 15	4 to 20	10 to 16	.8125, 1.335, 1.750
SPINDLE	2 to 7	7 to 18	6 to 20	10 to 24	.8125, 1.335, 1.750

Special heads, tapers, shanks and points made to order.

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RED-E TOOLS **READY TOOL COMPANY**

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are French, German, and Spanish glossaries giving translations of every product term used in the guide, each being numbered for easy reference between the English headings and their translations.

Other sections include an alphabetical directory of members with addresses, products, branch offices, overseas agents, and subsidiary companies, and a list of trade names and trademarks.

•

ELECTRONIC TRANSFORMERS AND CIRCUITS—*By Reuben Lee, advisory engineer, Westinghouse Electric Corp. Published by John Wiley & Sons, 440 Fourth Ave, New York 16. 360 pages. Price $7.50*

A second edition, this work covers advances since 1947 in addition to fundamentals on the design of transformers for electronic apparatus. New material is on magnetic amplifiers, pulse circuits, rf power supplies, reactor surges, toroid curves, wide-band transformers, and charging chockers. The book also discusses core material, transformer theory, reactor theory, and other points.

•

THE METALLURGY OF ZIRCONIUM, *National Nuclear Energy Series, Div VII, Vol 4—Edited by Benjamin Lustman, Atomic Power Div, Westinghouse Electric Corp, Pittsburgh, and Frank H Kerze, Jr, Reactor Development Div, Atomic Energy Commission. Published by McGraw-Hill Book Co, Inc, 330 W 42nd St, New York 36, NY. 776 pages. Price $10.00.*

Less than a hundred pages of this volume are devoted to the fabrication of zirconium, but that section is still the most complete coverage of the subject we have encountered.

Each chapter has been written by one or more people who have specialized in that phase of the subject under an AEC contract. It is a complete coverage from history to industrial safety requirements. The book was instigated by Admiral Rickover both to encourage further fundamental research and to stimulate commercial development. In their preface, the editors state that as much information as could be declassified has been included.

Although more complete information on fabrication would be desirable, it is probable that little if anything in this area was denied

declassification, and when the limited time that has been devoted to a study of this new metal is considered, remarkably detailed information is available on some operations.

Much is yet to be learned about the working of zirconium, but to have so much that is known assembled in one place is a real service to any plant that expects to tackle the metal.

•

MMH Materials Handling Manual —*Edited by Val Laughner, editor,* Modern Materials Handling. *Published by Boston Publishing Co, Inc, 795 Boylston St, Boston 16, Mass. 384 pages, 8¼ x 11¼. Price $5.*

Intended to serve as both a basic reference and a working text, this new manual is edited specifically for the materials handling specialist and the engineer. At the same time, its broad coverage makes it suitable for use as a college text. Its seven sections include: The over-all problems of handling, plant layout and operations, warehousing and indoor storage, outdoor storage and yard handling, pallets, unit-loads, packaging, shipping and receiving, and handling of special shapes.

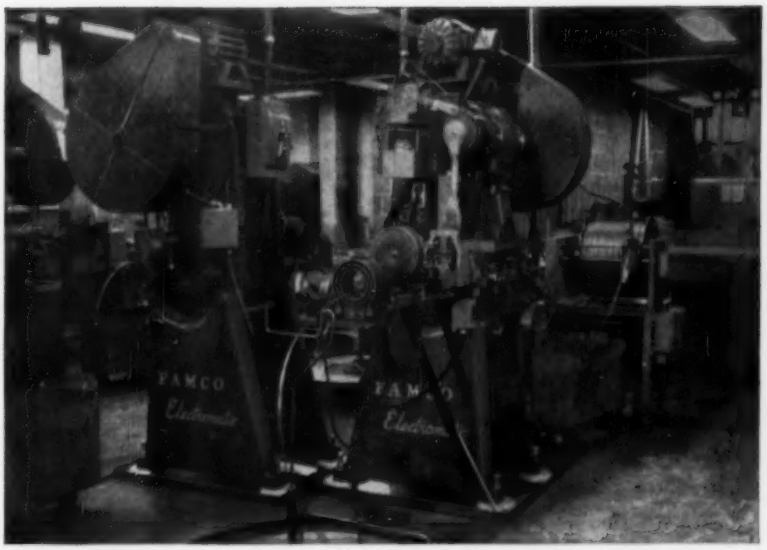
The various sections include major contributions from more than 30 specialists from industry, school, and government.

•

Industrial Furnaces—*Vol. II. Third Edition—By W Trinks, professor emeritus of mechanical engineering, Carnegie Institute of Technology. Three hundred fifty-eight pages, 6x9 in. Published by John Wiley & Sons, Inc, 440 Fourth Ave, New York 16. Price, $10.*

Professor Trinks, the recognized authority on furnace design, has put a great deal of new information into the third edition. For example, he gives more up-to-date information on fuels and their cost. Among furnaces, he shows improved designs for sealing car-bottom furnaces, for prevention of buckling in pusher furnaces, for completely mechanized arrangement of hardening and drawing furnaces, and for a labor-saving roll-down furnace. Many of the tables are new, including those on salts for salt baths, and the capacity of conveyor chains and wire belts.

The book is, of course, a broad treatment of furnaces, but a great



The busy-bodies of power presses—two of 10 Famco 18 Ton Presses busy perforating high carbon steel for a new type 98 chrome oil ring at Perfect Circle's Hagerstown, Indiana plant.

THESE FAMCO POWER PRESSES *are running by themselves!*

It may seem odd to see a power press working with nary an operator in sight. Odd but effective. And profitable. As a result of the continuous stroke action of Famco's ELECTROMATIC CLUTCH, only *three* men are needed to run the *entire* battery of ten Famco Power Presses at the Hagerstown, Indiana plant of Perfect Circle Corporation. Presses are run 24 hours a day, 6 days a week . . . and, process 8,000 feet of high carbon steel ribbon per hour!

These Famco Power Presses are used to manufacture the ring spacer-expander for Perfect Circle's new type 98 chrome oil ring. A large die holds a series of three smaller dies arranged to perforate, form and restrike ribbon steel into the spacer-expander section at the rate of one inch for each stroke of the ram. Ram travel (crankshaft throw) is one-half inch.

But volume production with minimum labor is only one of the features of these busy-bodies of the power press world. The 9-point, electrically operated jaw clutch can be changed from single stroke to continuous action *while the press is running!* All Famco Presses have heavy, one-piece frames cast of semi-steel with extra heavy ribbing for added strength. Solid one-piece crankshafts are high carbon precision ground to assure perfect alignment. And there are many more exclusive features.

To really recognize the superiority of a Famco Power Press you have to see it in action. Then you'll realize the power it delivers with ease. Why it's called a busy-body. 50 models to choose from—the most in the small press field.

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On Brown and Sharpe, and other automatics

INSERT CHASERS SAVE UP TO 33%

Insert chasers are like safety razor blades: they cost so little that you can throw them away when dull. Or, for utmost economy, you can resharpen them over and over again. Only a flash grind is required. For less than $40 you get a dozen sets of ¾–16 insert chasers, each set ground ready to go. You will be amazed at the quantity of threads they will cut, even to Class 3 specifications, with a minimum of downtime. FREE: "Unified and American Screw Threads."

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GUSHER Coolant Pumps

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Popular Model proved in performance by many leading machine tool builders

Gusher Coolant Pumps are available in a wide variety of models to fit almost any requirement. You can choose from immersed, pipe connected, and flange mounted for external or internal discharge in either motor or belt driven types. Tank mounted models for portable use are also available.

This United States #1 Hand Milling Machine manufactured by U. S. Burke Machine Tool Co. is equipped with a Gusher Coolant Pump.

Ruthman centrifugal pumps are also available as circulators, agitators, molten metal pumps. Write us your requirements. We will be glad to furnish you further information.

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deal of the information is related to furnace design and fuel-burning equipment for equipment used in fabricating plants.

•

SALT AND WATER, POWER AND PEOPLE —*By Robert E Thomas. Published by Hooker Electrochemical Co, Niagara Falls, NY. 109 pages, 6 x 9.*

Marking the 50th anniversary of the Hooker Electrochemical Co, this interesting book traces the growth of the company from Elon Hooker's little caustic soda and bleach plant to the huge industry of today. It starts with the formation of the original company, its tests and acceptance of the Townsend process, its early successes and failures, effects of war, depression, and recovery, and concludes with postwar expansion and research into new chemical fields.

•

GEAR DESIGN AND PRODUCTION—*By Reginald Trautschold. Published by Columbia Graphs, Columbia, Conn. 204 pages, 6 x 9 in. 133 illustrations. Price $4.50.*

Rules and working formulas are the feature of this book by a well-known technical author and consulting engineer. He is the author of the *Standard Gear Book* and the *American Machinist Gear Book* as well as of texts on other subjects. This is essentially a restatement of the basic principles and a re-proving of the rules, plus gear design formulas. The author deals first with profiles, then with speeds and power and with tooth and gear proportions. Thereafter, a chapter each is devoted to design of the various types of gears, to gear production, materials and heat treatment, inspection and recent cutting methods.

•

HANDBOOK OF ENGINEERING MATERIALS *Edited by John Seastone, mgr research, development & engrg, Metals Div, Olin Mathieson Chemical Corp, and Douglas F Miner, Carnegie Institute. 1,382 pages, 5½ x 8½ in. Published by John Wiley & Sons, Inc, 440 Fourth Ave, New York 16, NY. Price $17.50.*

Some 50 specialists contributed to this new handbook, which gives electrical, thermal, chemical and appearance properties in addition to

HANNIFIN AIR AND HYDRAULIC CYLINDERS

When a name is your guarantee of both quality and service

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Send for already-prepared briefs on any special location in mind or an all-state "Industrial Location Factors" brochure.

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Raleigh 18, North Carolina

Governor Luther H. Hodges, Chairman of the Board

physical properties of various materials. There are four major sections, the first on specifications, standards, math and physical tables, the second on metals, the third on non-metals, the fourth on construction materials. Many special-purpose alloys are covered, plus ceramics, fuels, carbon products, industrial chemicals, lubricants, organic finishes, paper, fiber, plastics, cements and concretes, roadbed materials, timber, rope, weather and moisture protection, and glass products. It also shows changes in materials during fabrication and helps in computing costs by making comparisons of competitive materials easy.

•

APPRENTICESHIP PAST AND PRESENT—*Published by US Dep't of Labor, Bureau of Apprenticeship, Washington, DC. 34 pages 6 x 9. Price 20¢. Obtainable from Superintendent of Documents, US Government Printing Office, Washington 25, DC.*

Apprenticeship is as old as craftsmanship itself, but it is a far cry from the virtual peonage of medieval times to the comprehensive, supervised, broad-scale programs enjoyed by today's apprentices. This interesting booklet traces the development of apprenticeship in this country, since its earliest days, explaining the step-by-step improvements that have taken place. There are copies of early indentures in various trades, including that signed by US Senator Ralph Flanders of Vermont with Brown & Sharpe, under the terms of which he was paid 4¢ per hr for the first year. Contrasted with this are copies of modern apprentice agreements. The book concludes with a review of national legislation relating to apprentices.

•

NEW BOOKS

BIBLIOGRAPHY ON MACHINERY FOUNDATIONS: DESIGN, CONSTRUCTION, VIBRATION ELIMINATION — *Published by The Engineering Societies Library, 29 West 39th St, New York 18, NY. Price $2.*

This is a revised list of 175 annotated references to selected books and periodical articles published from 1924 to 1955. They cover theory, design, and construction of machinery foundations; specific problems such as heavy foundations on unstable soils; and vibration as related to foundations of hammers, engines, electrical machinery, turbines, com-

pressors, machine tools, pumps, and presses.

•

New Films . . .

PORTABLE PARADE—*Produced by The Oster Mfg Co, 2057 E 61st Place, Cleveland 3, Ohio. 16-mm, sound, color. Running time 20 min. No charge.*

When you are selecting a pipe-threading machine for portable use, either in the shop or out on the job, there are a lot of things to watch out for. This new film shows how to make the best selection and how to use the machine to best effect.

•

LIFELINE — *Produced by Macwhyte Co, Kenosha, Wis. 16 mm, black and white, sound. Running time 22 min. No charge.*

The importance of wire rope as a lifeline in modern industry is explained in this new film which takes the viewer on a guided tour of a wire and rope mill where all the processes in making the product are explained. The trip closes with an explanation of the ways in which wire rope is made into various slings and assemblies.

•

TOOLS OF ABUNDANCE. *Produced by Wesson Co, 1220 Woodward Heights Blvd, Ferndale 20, Mich. 16 mm, sound, color. Running time 28 min. No charge.*

By using a case history of an actual production part of a new product, this film shows the individual importance and complete interdependence of the various members of a modern "production team" — design engineers, process engineers, tool engineers, tool grinders, machine operators, purchasing dep't, and others. It starts with planning conferences between top management and department heads, and follows through the various stages of development. With unusual frankness, it shows some of the wrong turns taken, some of the mistakes made, some of the test runs that failed. The decision to develop completely new tooling is made, and all seems well until, for no apparent reason, everything goes haywire. The metallurgist's part in solving the difficulty is then shown.

Included also are close-ups of a

SHELDON Precision LATHES

for the size Lathes

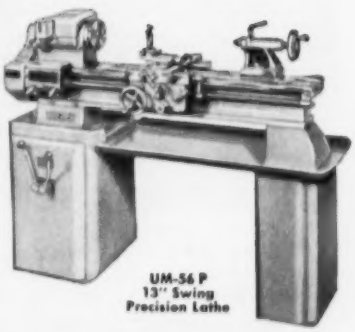
You Need Most

Sheldon lathes are built in the sizes you need most, for toolroom and production jobs. They are available with swings of 10", 11" and 13". . . in varying bed lengths with 18" to 48" center distances . . . and . . . in your choice of pedestal, cabinet or bench mountings.

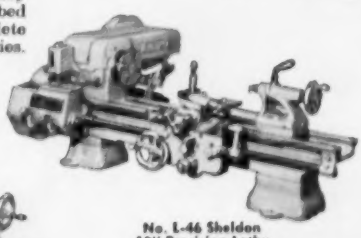
Powerful, all-V-belt, drive units — either the standard 8-speed (or 16-speed) E-drive; or the production favorite, a rapid, lever-shift U-drive. Where higher spindle speeds are desired, the standard E-drive can be built to provide speeds up to 2,000 r.p.m.

All Sheldon Lathes have handscraped, built-in precision. Each lathe is guaranteed to meet or surpass the American Standards for Toolroom Accuracy. With every Sheldon Lathe goes a copy of the accuracy tests actually performed on that lathe. (19 checks).

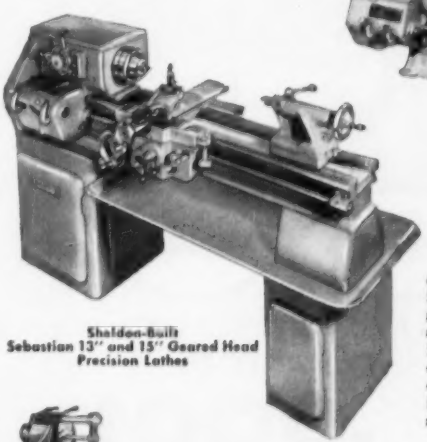
Important optional features include: hardened bed ways, L00 Long Taper Key Drive spindles, 4" D1 Camlock spindles, bed turrets, taper attachments and a complete line of toolroom and production accessories.



UM-56 P 13" Swing Precision Lathe



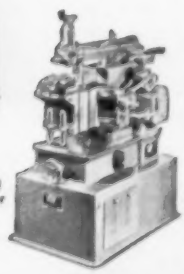
No. L-46 Sheldon 10" Precision Lathe



Sheldon-Built Sebastian 13" and 15" Geared Head Precision Lathes

The new Sheldon-built Sebastian Geared Head Lathes have greatly increased work capacity and many advanced features. These include a wide, heavy, hardened and ground bed . . . easy shifting spindle speed dial . . . 60-pitch gear box . . . independent drop lever apron clutches . . . cam-action tailstock clamp . . . and, automatic lubrication in the headstock and apron with "1-shot" lubrication of carriage.

SHELDON Horizontal Milling Machine



SHELDON 12" Shaper

Send in coupon or write for catalogs and names of nearest Sheldon and Sebastian Distributors where you can see these new lathes in operation.

SHELDON MACHINE CO., INC.
4234 North Knox Avenue, Chicago 41, Illinois

Gentlemen: Please send new catalogs describing:

☐ Sheldon ☐ 10", ☐ 11" ☐ 13" Lathes
☐ Sebastian 13" and 15" Geared Head Lathes
☐ Horizontal Milling Machine ☐ Name of Local Dealer
☐ Sheldon 12" Shaper ☐ Have representative Call

Name ..... Title .....

Company Name .....

Street Address ..... ☐ Company ☐ Home

City ..... State .....

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What Can A REVOLVING Trolley Crane Do For You?

This EUCLID CRANE

with a full revolving trolley solved the unusual problem with which a manufacturer was confronted.

Billets are picked up at the furnace and turned at right angles as the crane travels along the runway.

Manual manipulation of the load at its destination is avoided and the sequence of operations continues without interruption. Overall production is speeded and costs lowered.

Since this specially designed Euclid trolley is capable of revolving 360° it is adaptable to numerous other time saving operations.

Euclid standard cranes and hoists meet a majority of requirements. If your needs are unusual, however, Euclid engineers will design special equipment to handle the situation.

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"CRANE BUILDERS"

mail coupon now for free demonstration or literature!

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OFFSET BORING HEAD
repeats to
.0001"
in 30 seconds

DEKA-BORE (and only DEKA-BORE) can be adjusted in fractions of 1/10,000" on the full diameter as easily as reading 1/16" on a steel rule. NOT A VERNIER OR SCROLL ADJUSTMENT. Can be calibrated in increments of .00005 on radii or .0001 on diameter as easily as picking up .002 on a conventional micrometer dial.

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☐ Name of nearest DEKA-BORE distributor, who will arrange free demonstration.
☐ Free literature and prices.

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wide range of machining operations, including operations on lathes, automatics, planers, duplicators, milling machines, broaches, transfer machines, and crankshaft grinders.

The picture is recommended for showings to foremen's clubs, tool engineers' meetings, and for instruction in plants, high schools, trade schools, and colleges.

•

DIE CASTING—HOW ELSE WOULD YOU MAKE IT?—*Produced by the American Zinc Institute, 60 E 42nd St, New York 17, NY. 16-mm, color, sound. Running time 35 min. No charge.*

Everybody wants to know how to save money and, at the same time, make a better product. You can get a lot of useful information in that direction from this movie. It tells how designers can effect cost reductions and shape a better product by exploiting the virtues of the die-casting process. Directed at industrial management, technical societies, and educational groups in general, it depicts the scope and versatility of the process by showing the widespread production and use of die castings in commerce, industry, transportation, and the home.

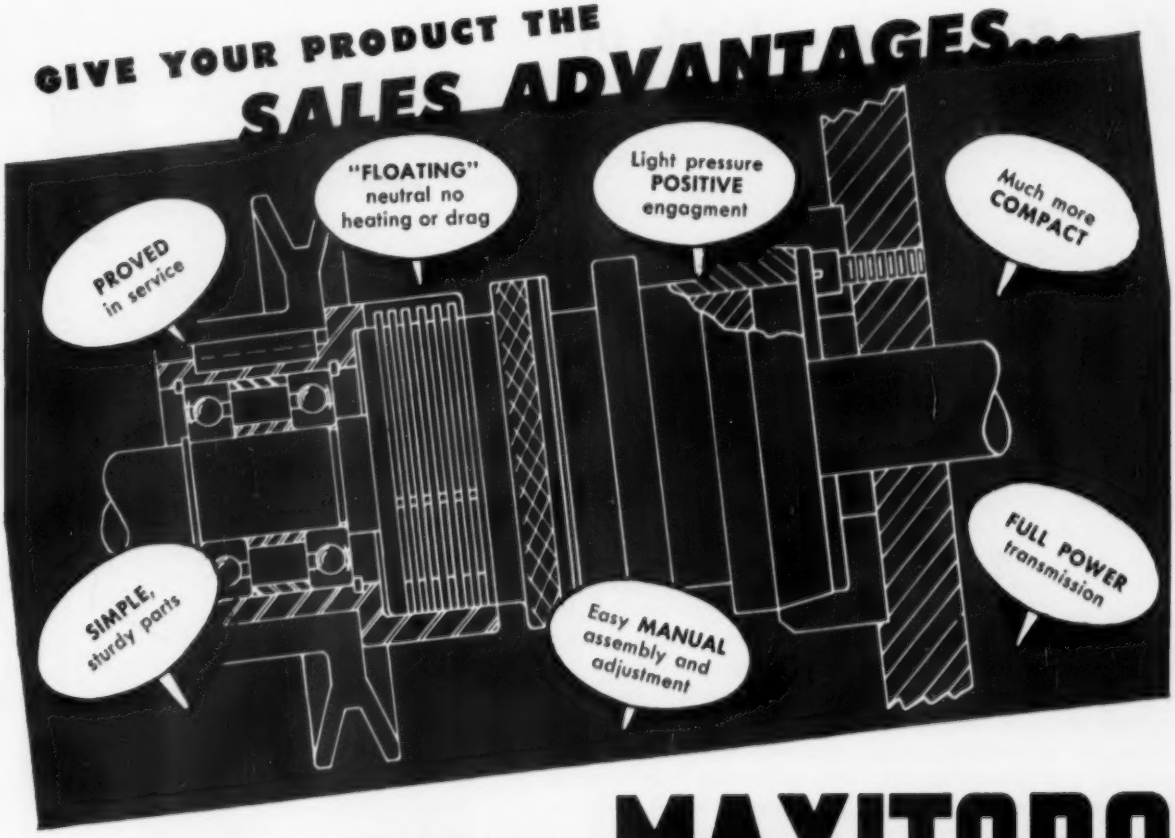
•

THE ULTIMATE STRUCTURE—*Produced by Research & Control Instruments Div, North American Philips Co Inc, 650 S Fulton Ave, Mount Vernon, NY. 16-mm, sound, black & white. Running time 40 min. No charge. Prints purchasable at cost.*

The difficult and complex subject of X-ray diffraction and spectrography is most effectively explained in this unusual film. It is readily understood, and it clearly outlines how elements and compounds are identified and measured by study of their atomic structure.

Wave motion and crystal theories are demonstrated, and typical examples are shown to illustrate research and production control applications in industry. The three analytical X-ray techniques of diffraction, diffractometry, and spectroscopy are adequately covered, and the basic differences in the construction and use of the three instruments is emphasized. With this information, it is shown how to select the proper X-ray analysis tool for a specific job.

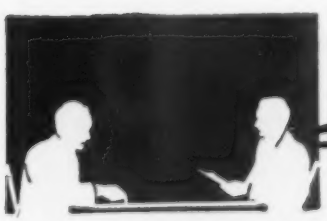
GIVE YOUR PRODUCT THE SALES ADVANTAGES...



...OF A PROVEN MAXITORQ floating disc CLUTCH

The above line drawing illustrates a single MAXITORQ Clutch arranged for single V-belt drive with a special sliding beveled shifter sleeve acting as a light brake.

Yes, there are many types of MAXITORQ . . . single, double, overload release . . . to meet every installation need. Get our comprehensive technical data . . . let our engineering department help you work out special drive problems. Write or phone: Dept. AM-3, The Carlyle Johnson Machine Company, Manchester, Conn.



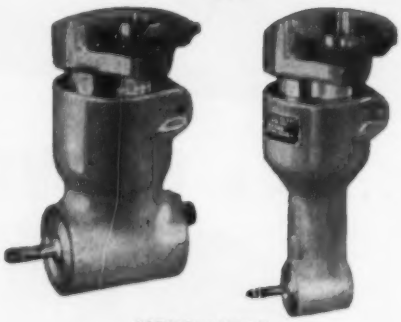
Let's talk MAXITORQ

The Basic Idea back of Bridgeport

TURRET MILLING MACHINES
was conceived, created, developed and made universally practical...by
BRIDGEPORT ENGINEERS

UNIVERSAL acceptance of Bridgeport Millers has established beyond the shadow of a doubt that the basic principle in these machine tools is *RIGHT*. It also means that there was a definite need for a machine of this type to replace other machines which had outlived their usefulness. It means, too, that Bridgeport Turret Milling Machines can be installed in any shop for tool room or production line without radically upsetting procedures which have been in conventional use.

BRIDGEPORT MILLERS have met existing conditions universally. Careful production planning in Bridgeport's own new shop has made it possible to offer *exclusive* advantages at a maintained reasonable price, a fact which indicates that their designers and manufacturers have made an outstanding contribution to modern metal working progress.



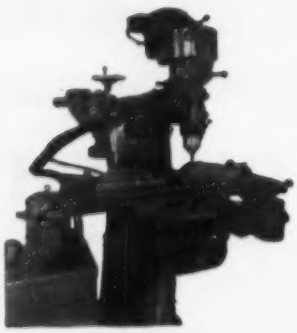
RIGHT ANGLE ATTACHMENTS

(Above) Heavy Duty . . . for milling and drilling at right angles; fits both Master and 1 HP Bridgeport Heads.

(Above) Light Duty . . . for right angle milling and drilling narrow, deep molds and cavities.

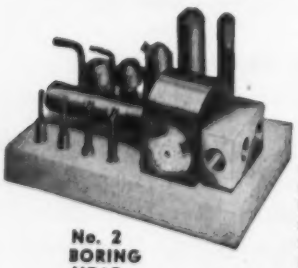
CHERRYING ATTACHMENT

Makes possible production of convex and concave shapes. Ideal for producing drop forge dies, molds, cavities.



TRUE TRACE COMBINATION

The Bridgeport True Trace Combination will give excellent performance and save endless hours when copying irregular dies and molds.



No. 2 BORING HEAD

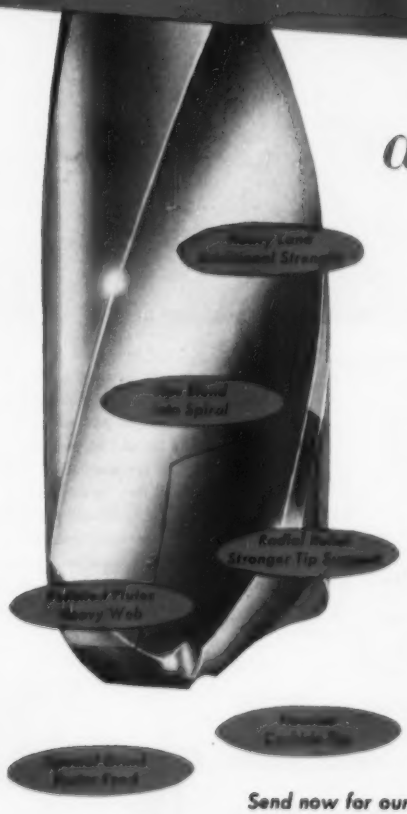
Boring Tools and Holder provide means for boring holes up to 6" diameter; available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.

Investigation of Bridgeport Milling Machines and their many attachments is always in order

Bridgeport MACHINES, INC.
Bridgeport, Connecticut
Manufacturers of High Speed Milling Attachments and Turret Milling Machines

here's the Super carbide drill for your job

STC



any quantity .... any style

As the biggest producer of carbide drills, we are able to offer a specific type for every carbide drilling application.

Exclusive features incorporated in these drills give greater tool life, faster cutting at lower cost.

High volume production facilities make tools available from stock.

Standards stocked in fractional, wire and letter sizes, in solid and tipped carbide; types for hardened steels, cast iron, aluminum, magnesium, plastics and abrasive substances.

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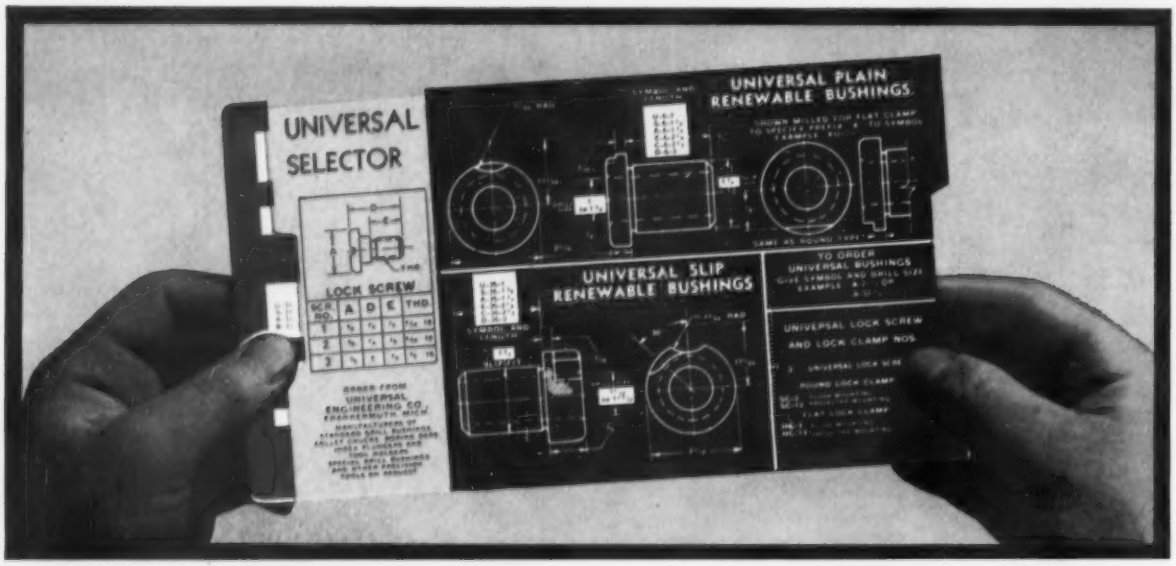
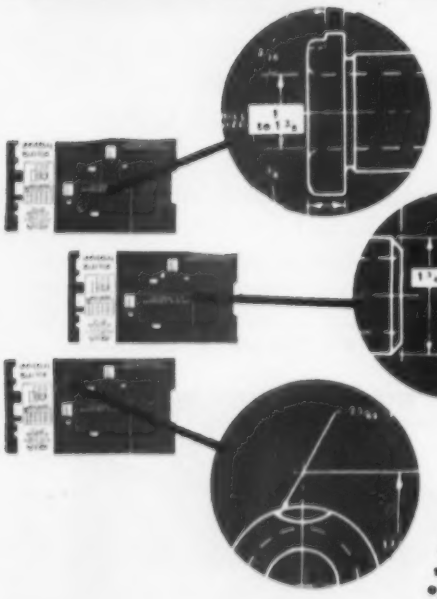
HOW THE UNIVERSAL DRILL BUSHING SLIDE CHART SIMPLIFIES JIG DESIGN

new plastic, pocket-size calculator gives all engineering data for the selection of all types and sizes of drill jig bushings up to 1¾" drill size





The SELECTOR is divided into four areas, one for each of the four types of bushings. The example shown here is for the plain renewable. Using this area, you move the slide until the correct drill size appears in the drill-size window.

Once the drill size is set up on the SELECTOR, all other factors now appear in the windows. This section, for example (shown actual size) shows correct bushing O.D. and dimension from center to flat for clamp.

This section shows the radius for lock screw. Every factor you need for drill bushing jig design as well as for ordering the correct bushing to fit that design is shown correctly, exactly, and at a glance on the SELECTOR.

A new service to regular users of drill jig bushings is this extremely practical plastic Selector slide-chart. When designing jigs, you will save many hours, and be certain of your accuracy, with the SELECTOR. It represents the result of six years experimentation and research by Universal Engineering Co. If you are an engineer specifying bushings and do not have one of these slide calculators—you can have one for your own design work by simply requesting it on your company letterhead. Don't wait—do it today!

193

UNIVERSAL ENGINEERING CO. FRANKENMUTH 1, MICHIGAN

SIMONDS CROSS-ROLLED STEEL

Makes a Simonds hacksaw blade last longer!

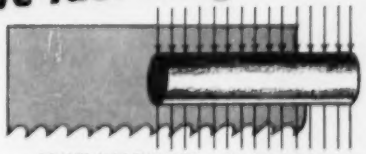
Look for ... ask for the blade with the "RED END"

Test after test proves that Simonds "Red End" Hack Saw Blades last uniformly longer. One reason is Simonds *cross-rolled steel* . . . steel that has a more uniform grain structure for added toughness.

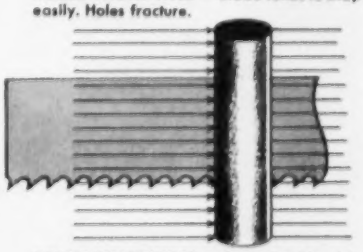
Another reason is Simonds own high quality steel — made especially for hack saw blade use.

Add to this Simonds improved method of tooth setting . . . and Simonds more uniform heat treating . . . and you've got the reasons why Simonds "Red End" Hack Saw Blades last longer, give more cuts per blade, cost less to operate.

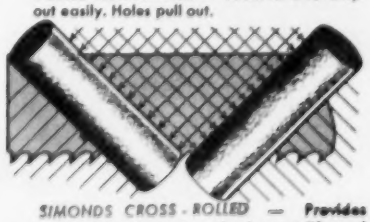
Furnished in all standard lengths and tooth sizes for hand and power use with a choice of High Speed MOLYBDENUM; High Speed TUNGSTEN; WELD-EDGE (High Speed Shatterproof); and STANDARD STEEL (Hand Blades only).



ROLLED WIDTH-WISE — Blade tends to snap easily. Holes fracture.



ROLLED LENGTHWISE — Teeth tend to strip out easily. Holes pull out.



SIMONDS CROSS-ROLLED — Provides toughest grain structure for longest life and resistance to breakage.

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PORTAGE

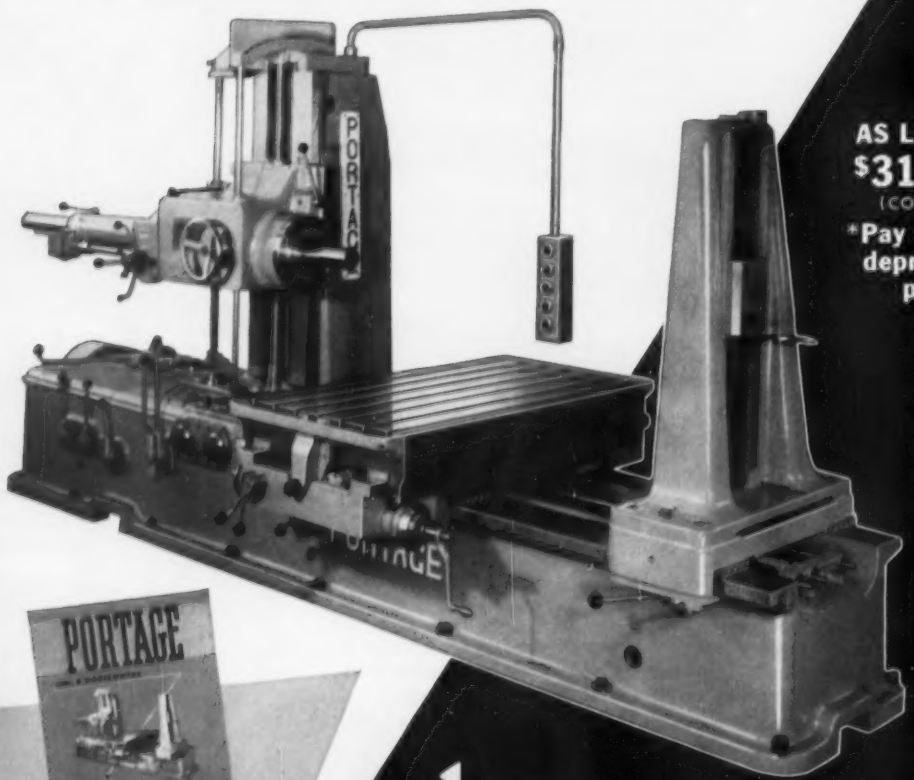
(4" Diameter Spindle)

Horizontal Boring, Drilling & Milling Machine

Outstanding . . .

MACHINE OF THE YEAR

Unsurpassed in Price and Quality



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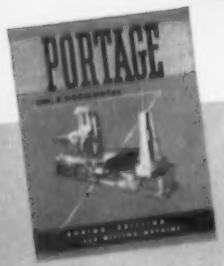
(COMPLETE)
***Pay as you depreciate plan**



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The PORTAGE Boring, Drilling & Milling Machine offers a *real* saving in new machine investment. PORTAGE mills cost from 5% to 20% *LESS* than present comparable makes . . . and the amazing part of this savings is the machine itself . . . Write today for literature covering all the specifications and features on the PORTAGE Mill.

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cut it with

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POWER HACK SAW BLADES

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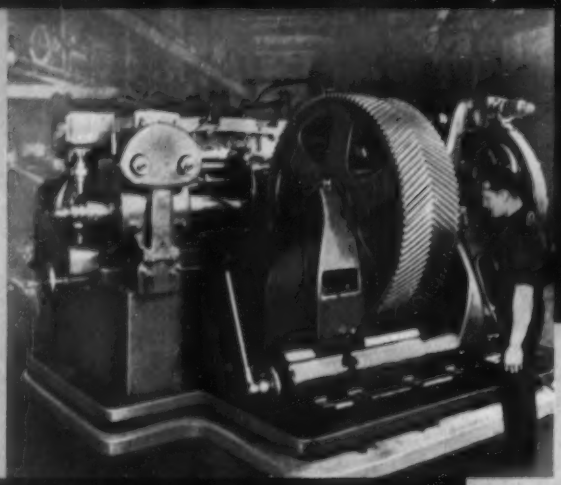
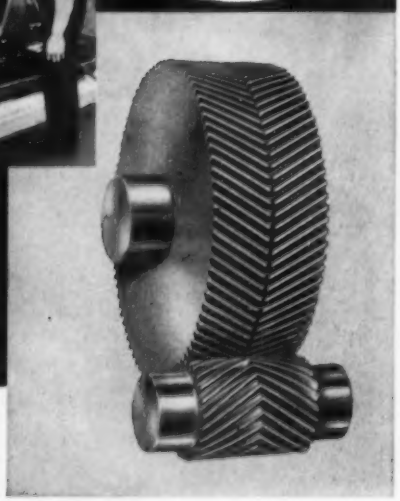


c-o-n-t-i-n-u-o-u-s TOOTH TYPE



for HEAVY SHOCK LOADS AT HIGH *SPEEDS*

Philadelphia gears for every purpose

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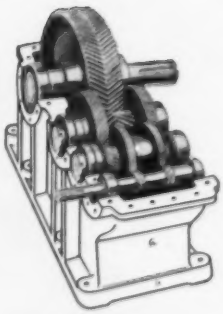
Continuous tooth herringbone gears—cut without separation between the opposing helical tooth surfaces—have no equal in gear capacity. They afford greater active face width, greater speed capacity, quieter operation than conventional double helical gears of equal size.

Philadelphia Herringbone gears are indicated for heavy load service, or where tough, continuous operation, shock and/or vibration are factors. Often referred to as "gears with a backbone", Philadelphia Herringbones offer extremely smooth power transmission in sizes up to 2 D.P.; 60" diameter, 18" face width. They create no end thrust, since the opposing helices counterbalance each other.

When specifying gear drives or speed reducers—insist upon Philadelphia, the most honored name in gearing for more than 60 years.



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No. 3-36

HYDRAULIC MILLING MACHINE

Now—the family of Kent-Owens Milling Machines has expanded to give you the same unexcelled milling accuracy, speed and dependability for *larger size work!*

Proudly we present the No. 3-36 Hydraulic Milling Machine . . . the new "big brother" in the line of popular Kent-Owens Millers. Each Kent-Owens machine is ruggedly designed with advanced features throughout for greater dependability and accuracy to maintain tough production schedules. Write for bulletin 955 on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines.

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No. 2-20DS . . . Double Spindle for two milling operations . . . 20" table travel . . . 42" x 12" table. Hydraulic feed.

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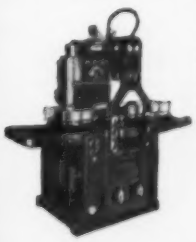

No. 2-20 . . . 20" table travel . . . 42" x 12" table . . . full automatic hydraulic feed.

No. 1-M . . . Hand feed to table and head . . . 25" x 9" table . . . 12" table travel . . . head counter-balance is adjustable.

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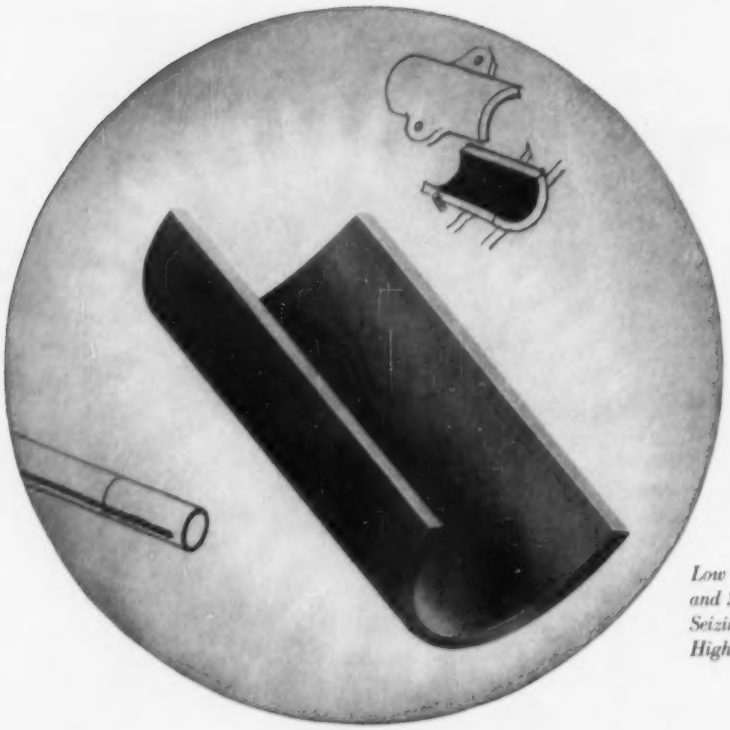
for MILLING MACHINES

KENT-OWENS REPRESENTATIVES



Low Friction Bushings and Sleeves Resist Seizing, Abrasion, High Temperatures

HAYNES STELLITE Bushings and Sleeves

Trade-Mark

...for handling Hot-Abrasive Materials

Bearing parts made of HAYNES STELLITE alloy resist seizing and galling. They are hard and abrasion resistant, and will withstand the pitting effects of many corrosives. They take a high polish and are easy to apply. Use them to reclaim worn shafts or bearing blocks, and to lengthen the life of new equipment.

Operate with Little or No Lubrication

Sleeves made of HAYNES STELLITE alloy can be used in areas where efficient lubrication is impossible. They resist seizing even when lubricants are diluted by gasoline, cleaning fluids, and other liquids that wash out an oil film. They operate at peak efficiency even when lubricants decompose under heat, or are destroyed by abrasive particles.

Tough and Abrasion-Resistant

Bearing parts made of HAYNES STELLITE alloy resist the abrasive effects of wet or dry materials such as fly ash, coke, metal powder, shale, and cement dust. They are hard enough to carry heavy loads, and tough enough to stand up under repeated stress.

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These bushings and sleeves can be submerged in many acids, alkalies, and molten metals. Temperatures as high as 1500 deg. F. have little effect on their hardness, toughness, and dimensional stability.

For more information write for our 8 page booklet on half bushings and sleeves.

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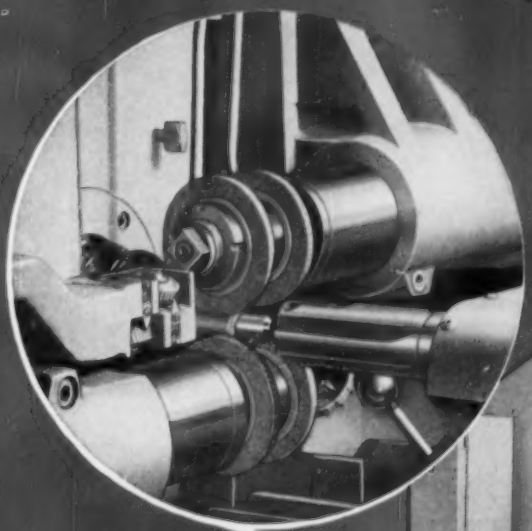

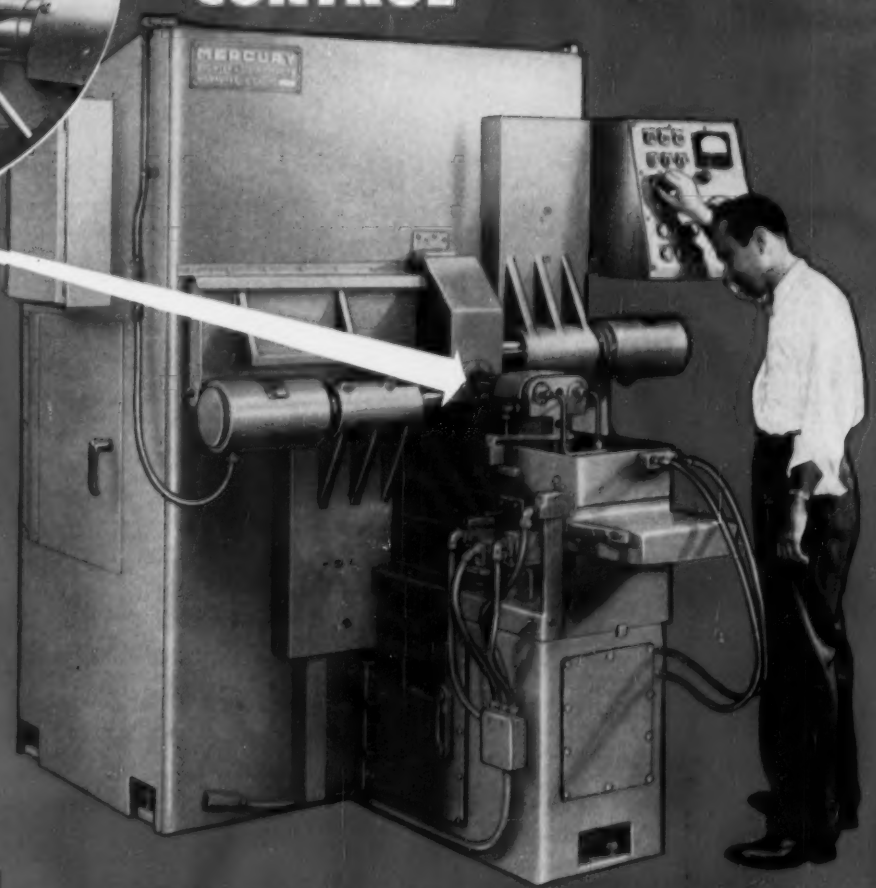

- Four surfaces precision ground simultaneously
- Automatic diamond dressing establishes size every cycle
- Automatic fixture guarantees "3D" stability
- Mercury's rugged simplicity assures sustained performance

A SYMBOL OF FINE CRAFTSMANSHIP SINCE 1933

This Mercury precision grinder finishes the four sides of two opposed keys on an automotive steering gear component at the rate of fifty pieces per hour. The part is rough ground and finish ground to size without manual handling or gaging.

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Milwaukee 2, Wisconsin

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Introducing the COMET II

An Advanced Conception of Valving by Ross!

- Direct solenoid operated, balanced spool 4-Way—for air or oil service.
- Engineered and built to tolerances of .0001".
- Conforms to JIC standards.
- Complete valve cycle within 0.033 sec.
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- Small and compact—7¼" by 3½" by 3⅞". ¼" diameter flow capacity.
- Available with ¼" or ⅜" pipe tap for inline, manifold or base mounted; single solenoid spring return, double solenoid momentary; double solenoid three position.

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Ross OPERATING VALVE COMPANY

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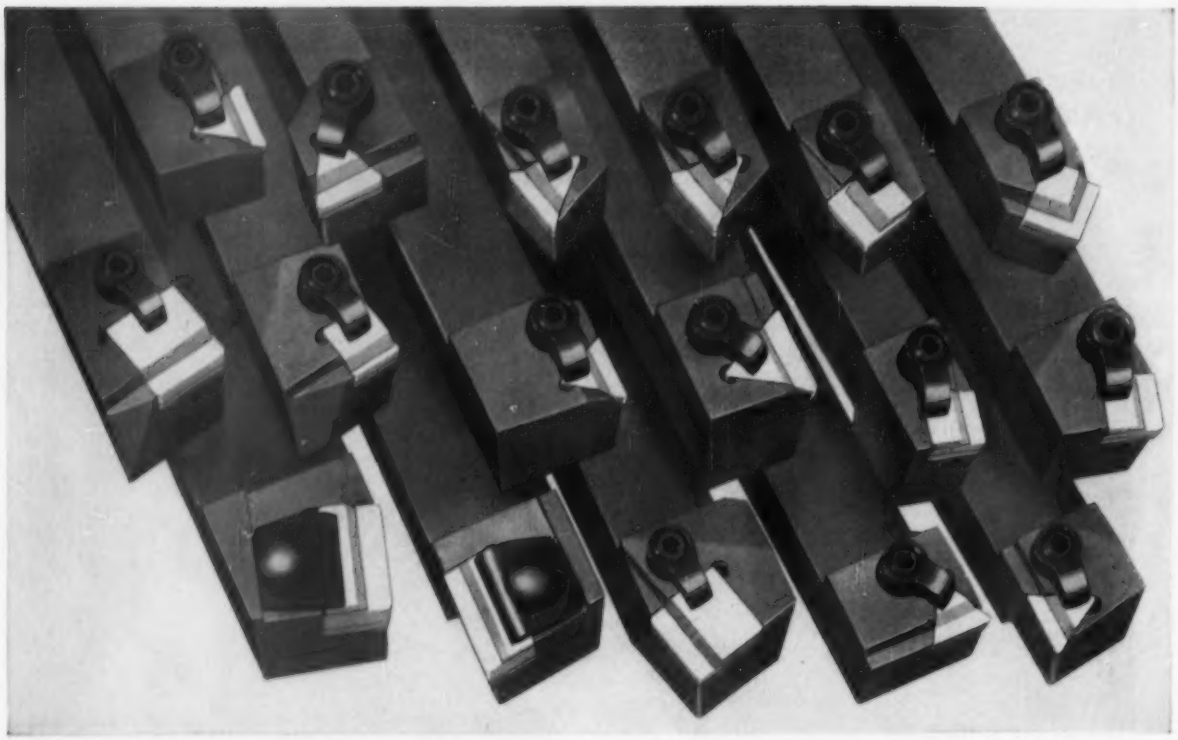

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KENNAMETAL* today offers the tooling for tomorrow

Kendex Button and Heavy Duty tools can truly be considered as the "Tooling for Tomorrow."

Kendex holders are simple and rugged in construction; fitted with trouble-free, interchangeable "hardware"; accommodate square, round and triangular turnover, throw-away button inserts that eliminate costly grinding . . . all features needed to keep tomorrow's high speed, highly synchronized production lines on the go—hour after hour.

"Tooling for Tomorrow" must face up to varied cutting jobs, on many types of machines . . . machines that will require quick, accurate tool changing for close tolerance work at high speeds and low costs per piece. Kendex tooling was designed for such conditions. In addition, it increases efficiency; lowers tool investments; sharply reduces maintenance costs. There are over 100 Kendex tools and 35 different Kendex inserts—some stocked in as many as six Kennametal grades.

Why not have a Kennametal tool engineer help you step up efficiency on today's jobs with Kendex "tooling for tomorrow." He works exclusively with Kennametal tooling . . . applying and servicing it. This specialized experience is yours for the asking. KENNAMETAL INC., Latrobe, Pennsylvania.

†Registered Trademark; Patent applied for
*Registered Trademark

A-9459

Eleven Kennametal Grades . . . To Give You Top Performance

No matter how versatile or rugged the toolholder—final performance depends on the cutting edge. Here's where hard, uniform, dependable Kennametal blanks and inserts will pay off on your operations—regardless of the job or machine. With eleven grades to select from, you can get top performance on every cutting job.

Try Grade K21, the ideal general purpose steel cutting grade that is outperforming all other general purpose carbides, and its companion . . . Grade K5H . . . a hard crater-resistant grade for finish machining at high speeds. Kennametal's simplified grade selection system makes it easy to get the right grade on every job.

INDUSTRY AND KENNAMETAL ...Partners in Progress

World's strongest TAPE?

Even 468 lbs. of wrestlers can't break it! "SCOTCH" Brand Filament Tape is amazingly strong, super shock-resistant. Thousands of filaments imbedded in the pressure-sensitive adhesive give it up to 500 lbs. tensile strength per inch of width. Four colors: Red, Blue, Black, White, and Transparent. Ask your tape distributor for the complete story, or write us direct. Always specify "SCOTCH" Brand, the *quality* tape . . . and stick with it!

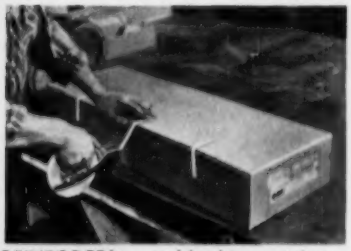
FILAMENT TAPE . . . *one of more than 300 Pressure-Sensitive Tapes for industry trademarked . . .*

REG. U.S. PAT. OFF.

SCOTCH
BRAND

See you at **booth 560, National Packaging Exposition,** Atlantic City, April 9-12

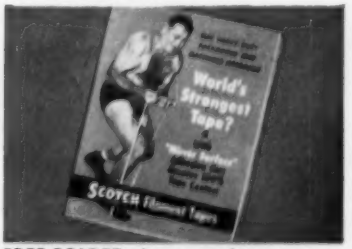
Look what you can do with it!



REINFORCE heavy shipping containers with strips of "SCOTCH" Brand Filament Tape. Tape won't cut cartons; won't loosen; is easily disposed of.

BUNDLE wood strips, metal pipe, conduit, other hard-to-handle long stock. "Mirror surface" adhesive of "SCOTCH" Filament Tape puts all the strength to work . . . holds securely.

PALLETIZE shipments for easier warehouse handling, storage, and shipment. Wrap of "SCOTCH" Filament Tape around top layer prevents load shifting or slipping.



FREE FOLDER gives complete story on "SCOTCH" Filament Tape; how to use it for heavy-duty packaging and materials handling. Write on your letterhead to 3M Co., Dept. MA-36.

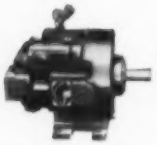
The term "SCOTCH" is a registered trademark of Minnesota Mining and Manufacturing Company, St. Paul 6, Minn. Export Sales Office: 99 Park Ave., New York 16, N.Y. In Canada: P.O. Box 757, London, Ontario. © 3M Co., 1956.

What's New in VICKERS HYDRAULICS

Illustrated here are new and recently improved units added to Vickers most complete line of oil hydraulic equipment. Look to Vickers as a single responsible source for integrated hydraulic systems. For characteristics of any of these components, please write for Installation Drawings by number.

SERIES T8 PIPELESS POWER PACKAGE consists basically of electric motor, hydraulic pump, control circuit and reservoir. Available in 3 circuits, 3 pump sizes and 3 electric motor sizes. Inst. Dwgs. 178706, 7 & 8.

V-LINE PISTON PUMPS AND MOTORS for 5000 psi. Unique design minimizes relative movement between rotating parts, provides increased bearing surfaces and reduces complexity of parts. Result is improved efficiency, longer life, and reduced maintenance. Supplied with straight thread connections. Bulletin 55-72.



Variable Displacement Pump With Servo Control. Inst. Dwg. 179061. Also available with pressure compensator control. Inst. Dwg. 179060.

Constant Displacement Fluid Motor. Inst. Dwg. 179059. Available also is a Constant Displacement Piston Pump. Inst. Dwg. 179058.

DG4S4 ⅜" solenoid operated. Inst. Dwg. 182412. ¾" available later.

DG5S4 ¾" solenoid controlled pilot operated. Inst. Dwg. 182413. 1¼", 2", 3" available later.

SOLENOID OPERATED 2- AND 4-WAY VALVES with many improved features. (1) Integral junction box (2) covers that retain the solenoids and (3) manual operation for testing. Compact and versatile. Gasket mounting simplifies installation and overhaul . . . also minimizes piping.

SEE VICKERS EXHIBIT at the TOOL SHOW BOOTH 1411

TRAVERSE AND FEED CYCLE CONTROL PANEL Improved design. Provides any cycle sequence of rapid advance, adjustable feed, dwell and rapid return motions. Maintains smooth and constant preset feed rate (either one or two) regardless of fluctuations in cutting tool resistance or hydraulic pressure.

CPP-2242 Solenoid Controlled, Pilot Operated (gasket mounted) provides smooth, low current operation. Inst. Dwg. 182414.

CG-03 Relief Valve (gasket mounted). Subplates available with pipe or straight thread connections. Inst. Dwg. 175630. CS-03 available with straight thread connections. Inst. Dwg. 175629.

CO2 Reciprocating Cycle Control Panel For Gasket Mounting. Inst. Dwg. 177083.

4CG-03 Pilot Operated Check Valve, gasket mounted. Inst. Dwg. 135468.

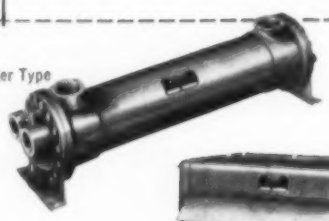
CG-714 Deceleration Valve, gasket mounted. Inst. Dwg. 172902.

CGV-06 5000 psi Relief Valve gasket mounted with straight thread connections. Inst. Dwg. 177609.

URG1 Unloading Relief Valve, gasket mounted. Inst. Dwg. 178974.

SG1 Pressure Switch, gasket mounted. Inst. Dwg. 172538.

Water Type



OIL COOLERS Vickers Oil Coolers are characterized by their very high rate of heat transfer per unit of space occupied. Bulletin 55-69.

Air Type

For further information on any unit shown, ask for Installation Drawing by number indicated. 7435

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
1410 OAKMAN BLVD. • DETROIT 32, MICH.

Application Engineering Offices: • ATLANTA • CHICAGO CINCINNATI • CLEVELAND • DETROIT • HOUSTON • LOS ANGELES AREA • (El Segundo) • MINNEAPOLIS • NEW YORK AREA (Summit, N.J.) PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) PORTLAND, ORE. • ROCHESTER • ROCKFORD • SAN FRANCISCO AREA (Berkeley) • SEATTLE • ST. LOUIS • TULSA • WASHINGTON • WORCESTER
IN CANADA: Vickers-Sperry of Canada, Ltd., Toronto

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

USE OF "HARTFORD SPECIAL" DRILL UNITS

INCREASES PRODUCTIVITY 211.7%

CUTS COST PER PART 32%

REPORT FROM WOODRUFF & EDWARDS, INC., ELGIN, ILL., SUCCESSFUL PRODUCER OF PARTS FOR LEADING MANUFACTURERS SINCE 1860

Processing cast iron pivot yokes for a major appliance manufacturer posed a problem for Woodruff & Edwards. The major headaches were:

1. The part was being milled, drilled, faced and turned on four separate machines.
2. Production per 8 hour shift was 600 parts, but required more than two men who consumed 22 manhours.
3. The scrap figure was very high.
4. Cost per part was high.
5. Loss and delay in handling were high.

Woodruff & Edwards solved the problem by designing and building their own production machine around four standard "Hartford Special" Air-Hydraulic Drill Units. The successful results:

1. Now in one machine, four holes are drilled, two spotfaced, one boss hollow milled, spotfaced and chamfered, another boss chamfered and a shoulder spotfaced and chamfered.
2. Production per shift is still 600 parts but requires only 8 manhours, an increase in productivity of 211.7%.
3. ***Not one yoke in over 100,000*** delivered to the customer ***has been rejected.***
4. A saving of 32% per part has been realized, including a recent rise in cost of material!
5. Parts are now handled by one man and are shipped directly to the assembly line of the customer with a minimum of delay.

PETE LENART, Dept. Foreman, says, "This is a very efficient operation with practically no machine maintenance. The setup is extremely compact because the Hartford Drill Units are space saving, and easy to install, too."

RICHARD HAMPEL, a Supt. of Woodruff & Edwards who helped design the machine says, "We have achieved a fine record on this job, and the Hartford Drill Units deserve the lion's share of the credit."

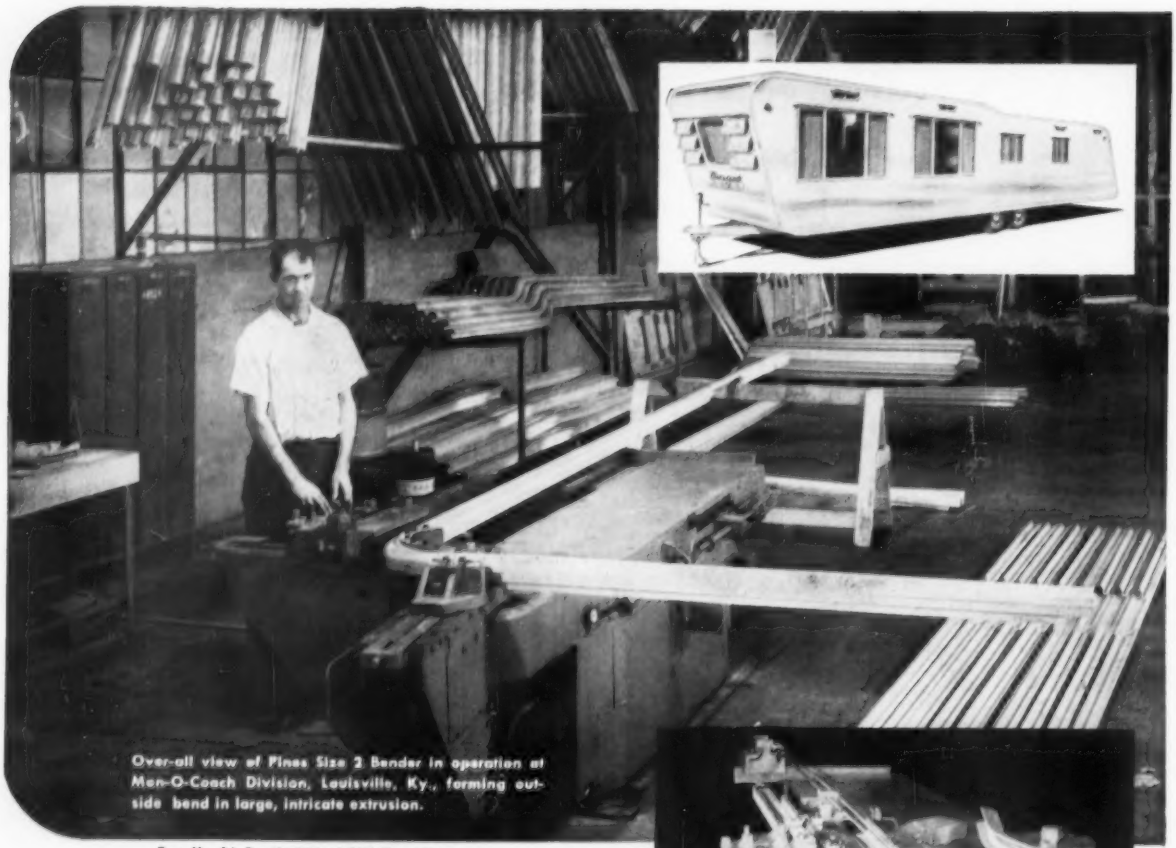
Take a tip from the Woodruff & Edwards story. Let "Hartford Special" Drill Units and other standard components bring higher production at lower cost to your plant.

MACHINE TOOL DIVISION

THE HARTFORD SPECIAL MACHINERY CO.

282 HOMESTEAD AVE., HARTFORD 12, CONN.

HARTFORD *Special*



Over-all view of Pines Size 2 Bender in operation at Mon-O-Coach Division, Louisville, Ky., forming outside bend in large, intricate extrusion.

See Us At Booth 197. ASTE Exposition.

PRODUCTION BENDING ALUMINUM EXTRUSIONS THE "PINES-WAY"

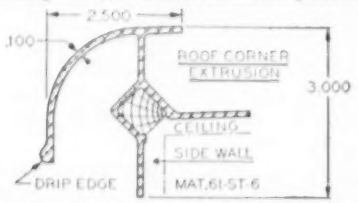
The new, luxurious Mon-O-Coach Mobile Home, manufactured by Mon-O-Coach Division, Ironwood Trailer Coaches, Inc., Louisville, Ky., is a marvel in modern metals engineering. It features all-aluminum structural members which are now cold formed and shaped accurately by production bending methods. Previously, many of the bends were formed by slitting and hand-bending a section, then re-joining the slotted section by welding. Today, a Pines Size 2 Production Bender handles these jobs fast and efficiently.

Slitting and Welding Operations Eliminated

All curved sections are now cold formed in a single operation, including an offset bend in an opposite plane in one of the most ingenious extrusions probably ever developed for the automotive industry. Shown in drawing, this large unique extrusion, incorporating a ⅝" wood section, is a top corner section which serves as a means of fastening top, sides, and front panel members together. Tooling by Pines forms neat, smooth bends without excessive distortion or wrinkling, completing the piece with the wood section in place. Previous slitting and welding operations are eliminated.

▲ View of tooling for making offset bend in opposite direction. Two plug-type mandrels support inner walls. Smooth, neat bends are formed at a bending arm speed of 6.0 r.p.m.

▼ Cross-section of Mon-O-Coach's intricate, top corner extrusion. Hollow center incorporates ⅝" wood section installed before bending—serves as a means for fastening wall studdings.



Write FOR MORE DATA

If you would like more data on production bending of aluminum extrusions the "Pines-Way", write for free copies of "Pines News". Or ask for a Pines engineer to call and assist you with any production problem.

PINES ENGINEERING CO., INC.

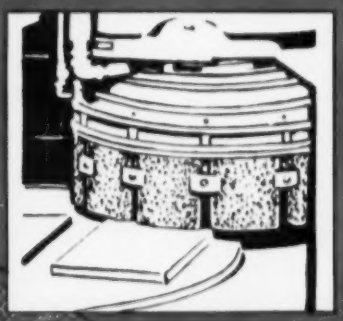
Specialists in Tube Fabricating Machinery · 672 WALNUT · AURORA, ILLINOIS

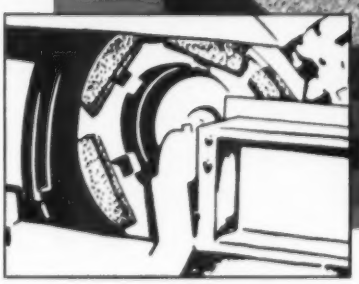
PRODUCTION BENDING · DEBURRING · CHAMFERING MACHINERY

Fast and Free Cutting for Surface Grinding

SIMONDS ABRASIVE CO.

ABRASIVE SEGMENTS





For substantial savings in surface grinding, use Simonds Abrasive Company Segments. Mechanically accurate in shape and size, they fit all segmental chucks, require no sulphuring, and grind more uniformly because of greater uniformity in grade and structure. Use them for gap type segmented wheels for fast, cool stock removal on large size pieces—and for solid type segmented wheels for small pieces chucked together. Write for bulletin ESA—188.

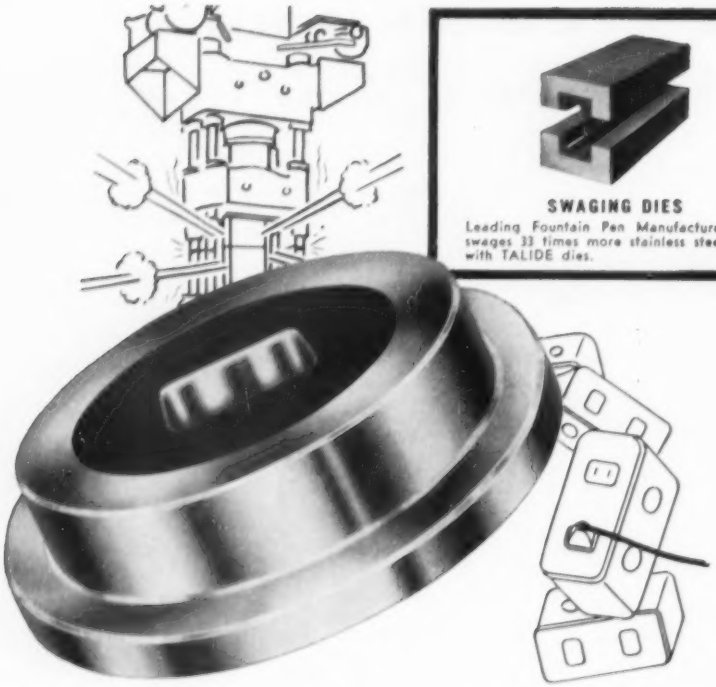
SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.

Branch Warehouses: Boston, Detroit, Chicago, Portland, San Francisco. Distributors in Principal Cities

Division of Simonds Saw and Steel Co., Fitchburg, Mass.

CALL **YOUR SIMONDS DISTRIBUTOR**

LOCAL STOCK FAST SERVICE



SWAGING DIES

Leading Fountain Pen Manufacturer cold swages 33 times more stainless steel parts with TALIDE dies.

HEADING AND EXTRUSION DIES

Cold-heading 1/4", C-1008 steel rivets, TALIDE dies produced 11,200,000 pieces, other carbide dies only 3,500,000.

CURLING ROLLERS

TALIDE Curling Rolls last 65 times longer than steel rolls on beverage can forming operation.

BLANKING AND FORMING DIES

70 times more paper discs blanked out with TALIDE — over hard alloy die.

SHEET METAL DIES

137,000 hi-alloy steel Pressure Vessels drawn with TALIDE, against only 7,900 with steel dies previously used.

POWDERED METALLURGY DIES

Compacting highly abrasive chemical powders, TALIDE Pill dies last 4 months, steel dies wore out in 6 hours.

25,680,000 PARTS PRODUCED with ONE TALIDE DIE

A large electrical equipment manufacturer was having difficulty maintaining production of electrical outlet boxes. Die costs were high, downtime and scrap excessive. It was necessary to remove and repolish the hi-carbon, hi-chrome die every 60,000 pieces. Total production secured from each steel die averaged 700,000 pieces.

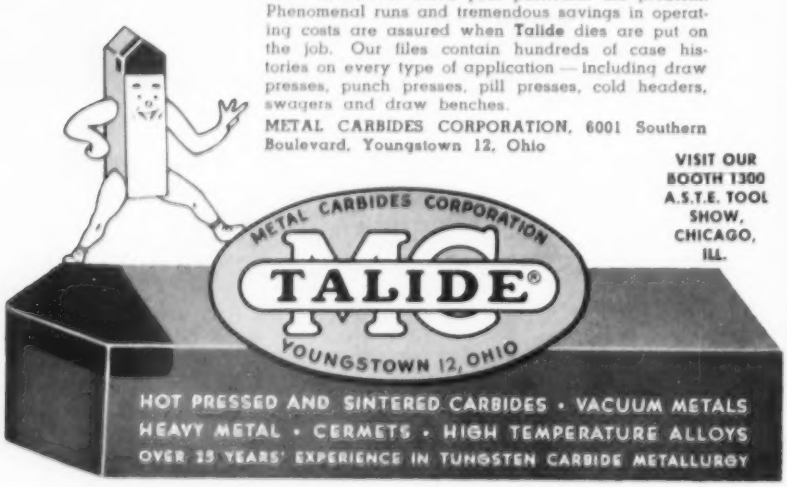
After an initial survey, our die engineers designed and installed a **Talide** die using **Grade C-88.** Operation is performed on a 75-ton double action Bliss press. Original die was put in operation 3 years ago and is still going strong, having been removed only once for repolishing — after drawing 15,000,000 pieces!

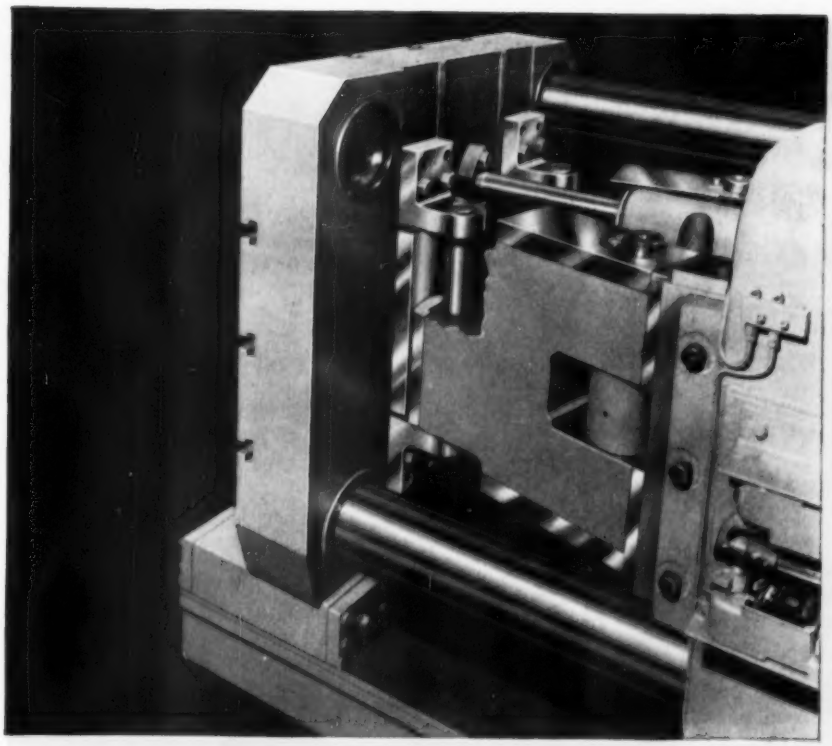
Total production obtained to date has reached the astounding figure of 25,680,000 outlet boxes — 36 times more production than when using a steel die. The Talide die costs $1,125.00 compared to $500.00 for each steel die. Savings in die cost alone has amounted to over $18,000.00 over the past 3 years, with substantial additional savings realized in increased production. Downtime, repolishing cost and scrap expense were completely eliminated.

Call in a **Talide** sales engineer for recommendations on how to solve your particular die problem. Phenomenal runs and tremendous savings in operating costs are assured when **Talide** dies are put on the job. Our files contain hundreds of case histories on every type of application — including draw presses, punch presses, pill presses, cold headers, swagers and draw benches.

METAL CARBIDES CORPORATION, 6001 Southern Boulevard, Youngstown 12, Ohio

VISIT OUR BOOTH 1300 A.S.T.E. TOOL SHOW, CHICAGO, ILL.

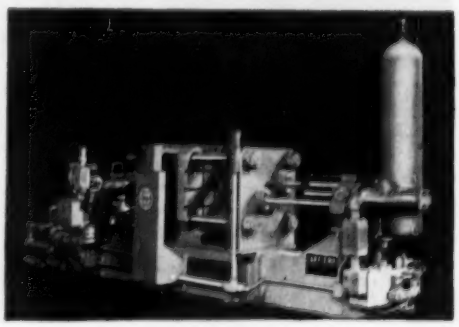

METAL CARBIDES CORPORATION
TALIDE®
YOUNGSTOWN 12, OHIO
HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • CERMETS • HIGH TEMPERATURE ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY



15% to 25% MORE DIE CASTINGS PER DAY

with new knuckled Wedge Cam Toggle

- Time saved on adjustments and die set up with Wedge Cam Toggle gives you from 15% to 25% more time in actual production. The Wedge Cam Toggle is an accurate, self-compensating clamp. It automatically takes up clearances in the dies caused by contraction and expansion of the molds during production or shut-down periods. Wedge Cam Toggle also makes it possible to set dies in a single cycle in many instances. All models of the new Series D "expandable" die casters incorporate the new knuckled joint to eliminate shear stress on the pins.



LAKE ERIE
DIE CASTING MACHINES

LAKE ERIE ENGINEERING CORPORATION
507 Woodward Avenue, Buffalo 17, N.Y.

LAKE ERIE ®

TYPICAL DIE CASTERS
who use Lake Erie Machines

ALLIS-CHALMERS MFG. CO.
FORD MOTOR CO.
JOHNSON MOTORS
KIEKHAEFER CORP.
DAVIDSON MFG. CO.
THE DOW CHEMICAL CO.
LUDMAN CORP.
GENERAL ELECTRIC CO.
GENERAL CONTROLS CO.
HOOVER CO.
GENERAL MOTORS — TERNSTEDT DIV.
HUNTER FAN & VENTILATING CO.
BOHN ALUMINUM & BRASS CORP.
CENTRAL DIE CASTING & MFG. CO., INC.
THE ELECTRIC AUTO-LITE CO.
MCCULLOCH MOTORS CORP.
MACKLANBURG-DUNCAN CO.
RUPERT DIECASTING CO.
SUPERIOR DIE CASTING CO.
WESTINGHOUSE ELECTRIC CORP.

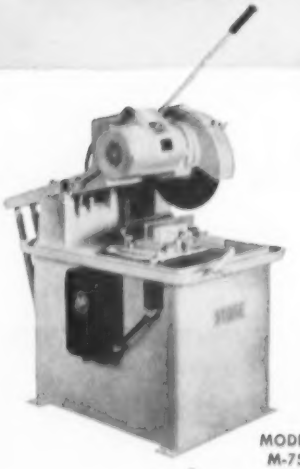
SEND FOR NEW BULLETIN 255
(Ask about 16mm. film)

Patented Wedge Cam Toggle and "Pressure-Pac" fully described.

More Industries Are Turning To
STONE HIGH SPEED CUTTING MACHINERY
...for Greater Speed, Accuracy, Economy

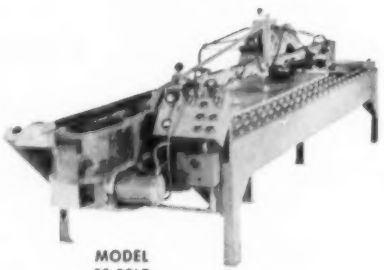
CUTS:
TUBING, BARS
SHEET & PLATE
PIPE
STRUCTURALS
EXTRUSIONS

More and more industries are changing to the modern Stone method of cutting. That's because Stone Machinery cuts to a fine finish any ferrous or non-ferrous metal in just 2 to 4 seconds per square inch! These highly versatile high speed machines cut with superb accuracy, giving you tremendous savings in time and cost. Stone has machinery to answer your every cutting need. You owe it to yourself to consider Stone High Speed Machinery for your cutting operations.



MODEL M-75

Model M-75 16" Heavy Duty This 7½ HP model for cutting ferrous metals up to 2½" solids, 3¼" standard pipe and 4" structurals has a geared-in-head motor for positive drive. Rugged and economical, easily handles heavy cutting jobs. Equipped with fast acting, self-centering vise.



MODEL SS-20LR

Model SS-20LR New Traverse Type Machine Cuts plate and sheet stock, ferrous, non-ferrous, plastics, asbestos products, die stock, micarta, melomine, plywood and structurals. Features new interlocking base and new channel-type rails. Air cylinders equipped for variable downward pressures of up to 535 lbs. maximum. Variable speed of feed drive — ½ HP. 0 to 30 ft. per minute. Cuts 4 ft., 8 ft. or 12 ft. lengths with reasonable stock clearance.

MODEL M-35A

Fully Automatic Cut-Off Machine with Single Bar Feed Expressly designed for low-cost cutting of non-ferrous metal. Bar feed combined with power stroke of cutting head for automatic production cutting. Cut any lengths up to 6'. Model M-16 illustrated, other models available.

Model M-35A 12" Cut-Off Machine Cuts ferrous 1½" Solids, 2½" Standard Pipe, 2½" Structurals. Non-ferrous, 2½" Solids, 3" Tubing and Extrusions. Cuts Solids at less than 4 seconds per square inch, at any angle up to and including 45° — either direction. Geared-in-head motor.

MODEL M-16

Write For Our Complete Line Bulletin

STONE MACHINERY CO., INC.

151 Fayette St., Manlius, New York

"... represented in every major industry throughout the world"

POWER STROKE: Models M-75, M-16 and M-35 can be equipped with our power stroke attachment that enables the operator to perform the entire cutting cycle with one simple air control. Reduces operator fatigue and saves up to 25% on wheel costs. Manual cuts may also be made when desired.

BE SURE TO VISIT OUR BOOTH No. 755 AT THE A. S. T. E. SHOW

Four Sizes
10-16-26-35
lb-in torque100/psi

A New Series of DUAL-VANE Fluid Motors To Better Perform Functions Calling for Rotary Power

to better perform functions calling for rotary power. DUDCO Fluid Motors operate at higher continuous pressures . . . provide greater continuous horsepower output without increasing motor size. DUDCO Fluid Motors start, stop and reverse instantly, operate at an infinite variety of speeds, can even be stalled without damage.

DUDCO MF-100 Series Motors are built for continuous 2000 psi operation. They feature extremely high starting torques and provide constant torque throughout their entire speed range . . . start to 2400 rpm. Four sizes deliver up to 23.5 horsepower.

Member NFPA

Write for Bulletin No. DM-321

KALAMAZOO DIVISION
THE NEW YORK AIR BRAKE COMPANY

9001 E. MICHIGAN • KALAMAZOO • MICH.

INTERNATIONAL SALES OFFICE, 90 WEST ST., NEW YORK 6, N. Y.

MODERN MACHINERY BUILDERS TAKE TO HYDROSTATIC DRIVES

HYDRAULIC PUMPS AND MOTORS MAKE MACHINES MORE PRODUCTIVE

Many types of modern machinery require power at locations remote from the central power source. The transmission of this power has long been a problem to equipment builders and operators. Complicated mechanical-type transmissions have proven costly and troublesome. Breakdowns were expensive in repair costs and lost production time.

Recently builders of machinery have found a simple and dependable solution to this problem. They have been able to add functions to equipment and transmit power by the use of hydrostatic drives.

A hydrostatic drive generally consists of a constant displacement hydraulic pump, a constant displacement fluid motor, a directional control valve and connecting pipes or hoses. The hydrostatic drive effects power transfer by means of pressure changes rather than by velocity changes as do torque converters or fluid couplings.

Many advantages are found in the use of hydrostatic drives. Power is easily transmitted to remote and inaccessible places. Infinite speed ratios and accurate output speeds are possible. The operator can control his machine through run, idle or reverse operation with just a simple control valve. The system provides automatic overload and shock protection.

Successful applications of hydrostatic drives have improved the performance of a variety of machine tools. Cutting heads on milling machines, drill heads, heavy duty metal saws, conveyors and transfer tables on high production equipment are being driven hydrostatically. In refineries they drive pumps and fans in hazardous atmospheres; in saw mills they drive log barkers; on shipboard they drive winches. The adaptation of hydrostatic drives to all types of modern machinery seems unlimited.

DUDCO MF-100 Series Fluid Motors and PFM-100 Series Hydraulic Pumps have been developed by The New York Air Brake Company to provide hydrostatic drives for equipment which must give continuous, dependable service.

ENGINEERS

Exceptional opportunities for men of imagination to express new ideas in the design and development of Hydraulic Components. Company expansion and progress in this growing industry promise rewarding futures for engineers who qualify. Write, giving experience and full details.

KALAMAZOO Division
The New York Air Brake Company
9001-3 E. Michigan, Kalamazoo, Mich.

Gentlemen:

I would like further details on the new DUDCO MF-100 Series Fluid Motors ☐
Also details on DUDCO PFM-100 Pumps ☐

Name _____ Title _____

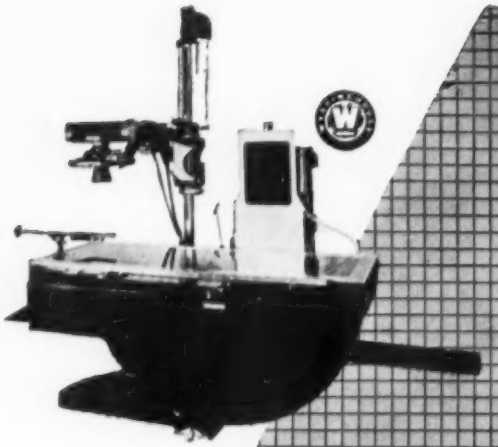
Company _____

Address _____

City _____ Zone _____ State _____

to save a life

X-ray tables require a precision all their own, for smooth, easy positioning. And, if you were to X-ray this Westinghouse Duoflex motor-driven table, you would see Federal Ball Bearings quietly at work here, too.



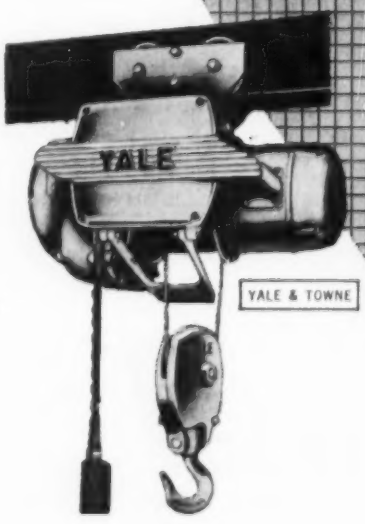
so much of industry *turns* on FEDERAL ball bearings

X-rays or escalators—hum of motors or heft of hoists—in the clinic or machine shop—Federal Ball Bearings do their quiet, anti-friction job. In your office, plant or home, you'll probably find some of the hundreds of types and 12,000 sizes produced by this 50-year-old manufacturer of ball bearings exclusively.

When Federal Ball Bearings are a part of so many things you *use*, shouldn't they be a part of the things you *make*?

175 pages, chock full of data about ball bearings are yours for the asking in FEDERAL's new catalog. Just drop us a line for your copy.

THE FEDERAL BEARINGS CO., INC. • POUGHKEEPSIE, N. Y.



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Husky electric hoists—capable of lifting and conveying up to 15 ton loads put a strain on bearings, too. In these mechanical "strong men", too, you'll find Federal Ball Bearings.

Federal BALL BEARINGS One of America's Largest Ball Bearing Manufacturers

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PMCo customers can tell you, we furnish only gages of the highest possible quality, backed by comparable service. Service is helping solve your inspection problems and in delivering your gages when you need them.

Our plant is shown here. Not shown is the group of fine craftsmen who make our quality possible. They are dedicated to producing only the best.

We are small enough to be personally interested in your individual problems . . . big enough to take care of all your requirements . . . flexible enough to give you emergency service when you need it. But we pledge never to sacrifice quality for size or flexibility or price.

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ask the man on the production line . . .

"I want P-K® self-tapping screws . . . I make more money with 'em!"

TV production line at Motorola, Inc., Chicago, Illinois

He does! You do, too!

Pay a man on a unit basis and he wants only the fastener that speeds production and eliminates rejects. That's why P-K Self-tapping Screws are preferred by men on the assembly line. They know through actual use that Parker-Kalon Self-tapping Screws are headed, threaded, pointed and hardened to keep assembly lines trouble-free!

Men in charge of production are P-K boosters, too. They know that the cost of the fastener is a fraction of the cost of using that fastener on the line—that P-K screws are actually the most economical. That's why the men who are responsible for production specify Parker-Kalon. They know . . . if it's P-K, it's O.K.

Sold Everywhere Through Leading Industrial Distributors. Warehouse In Chicago, Ill.

PARKER-KALON® *fasteners*

PARKER-KALON DIVISION • GENERAL AMERICAN TRANSPORTATION CORPORATION • CLIFTON, NEW JERSEY

and this, Rangers is my dad's brand new 10,000-lb. double frame hammer complete with redesigned valves, larger port openings through valves, and streamlined steam passages!

Pretty impressive stuff to a kid! But chances are your plant won't let the small fry near enough to even sneak a look at those big steam hammers. So here at Erie we've decided to give the kids a break. We've put out a book in their language—with pictures!—telling them all about forging from the crudest cave-man anvil and hammer to the latest hydraulic press. They'll learn a lot . . . and you . . . you'll be more a hero in their eyes than ever! Send now for your free copies of "Forgeland, U.S.A." Send, also, for descriptive technical booklets available on all Erie Hammers —Steam, Board Drop, Single Frame and Double Frame—yours for the asking—just write us.

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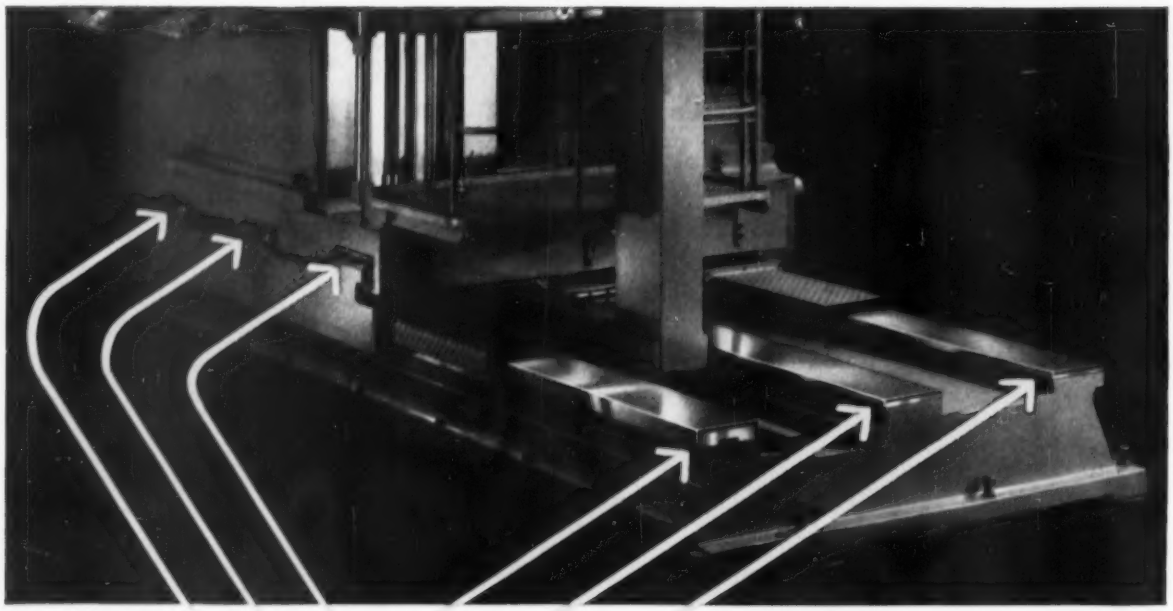


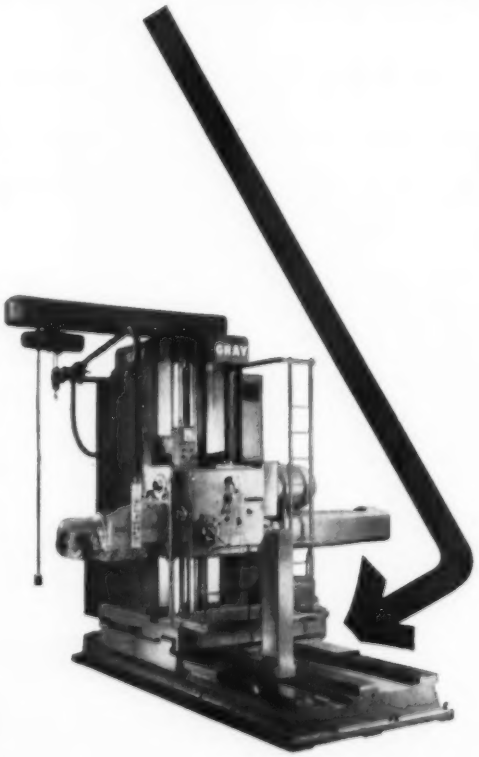
the G. A. GRAY CO. says OK hardened ways insure absolute accuracy during the long life of new 650 FC horizontal boring machine

THE G. A. GRAY CO., one of the world's most respected large machine tool builders, uses hardened and ground bedways and cross ways made by the Ohio Knife Co. In addition to insuring absolute accuracy during the long life of this machine, OK Hardened Bedways are the perfect mating surface for GRAY non-metallic bearing surfaces.

Specially heat-treated tool steel makes OK Ways practically wear-proof. Extreme hardness (65-66 Rockwell C) is uniform to a 3/16-inch depth or more. This is welded to a soft, tough steel backing under 2500 tons pressure, then precision ground to ±.0002 inches. OK Hardened Ways are available in a variety of shapes and sizes or can be made to suit your requirements.

THE G. A. GRAY CO. is one of many Machine Tool Builders using OK hardened products. Look for OK products on machines before you buy. They are a good index to over-all machine quality.

For free Ohio Knife bulletin, showing seven standard cross-sections in over 60 sizes, write Dept. 43-W.



Slitter Knives • Shear Blades • Work-Rest Blades • Cut-Off Blades • Hardened Spacers • Hardened Ways • Gibs • Ball Races • Bronze Ways • Wear Strips

THE OHIO KNIFE CO.

CINCINNATI 23, OHIO

Bodine CASE HISTORY NO. 42

HEADLIGHT ADJUSTING SCREW ASSEMBLY SPOTLIGHTS VERSATILITY OF BODINE METHODS

This is but one of many ways in which versatile, time-tested Bodine basic machines and units can be teamed to create high-speed, cost-cutting assembly units without resort to costly "specials."

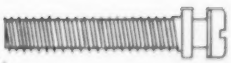
Note especially the ease and convenience with which auxiliary equipment (in this case automatic hopper feeds) can be grouped around the Bodine "chassis." Note also the high production and close limits maintained on this day-in, day-out production line job for one of the world's largest automobile manufacturers.

PRODUCTION: 3,000 completed assemblies per 50-minute hour. Machine speed, 30 strokes per minute.

1

Unthreaded molded nylon nut hopper-fed and transferred to the dial fixture . . . 2 pieces per stroke.

2



Adjusting screws hopper-fed, transferred and driven into nylon nut . . . 2 pieces per stroke.

3

Auto eject completed assembly. Depth of screw driving held consistently within ½ turn in untapped nut.

If high-speed, low-cost assembly is one of your problems . . . in metals, plastics, or a combination of both . . . with or without concurrent machine operations . . . check first with Bodine. The possibilities of our methods are practically unlimited.

Write Dept. AM-3

THE Bodine CORPORATION
BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES

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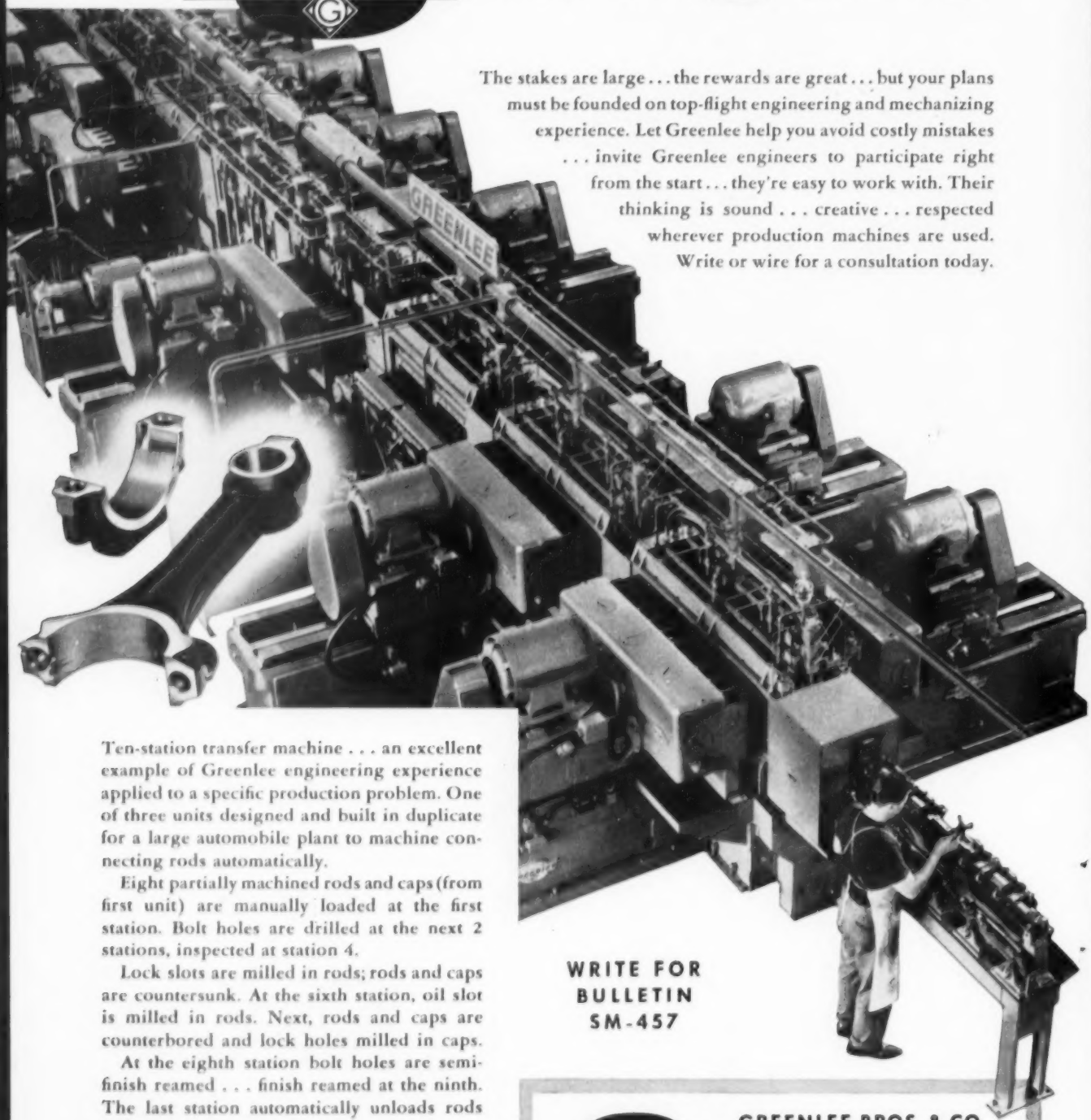
You've Got To Be Right

WHEN PLANNING FOR AUTOMATIC PRODUCTION!

PRODUCTION MACHINERY

Let GREENLEE Help You All The Way

The stakes are large . . . the rewards are great . . . but your plans must be founded on top-flight engineering and mechanizing experience. Let Greenlee help you avoid costly mistakes . . . invite Greenlee engineers to participate right from the start . . . they're easy to work with. Their thinking is sound . . . creative . . . respected wherever production machines are used. Write or wire for a consultation today.



Ten-station transfer machine . . . an excellent example of Greenlee engineering experience applied to a specific production problem. One of three units designed and built in duplicate for a large automobile plant to machine connecting rods automatically.

Eight partially machined rods and caps (from first unit) are manually loaded at the first station. Bolt holes are drilled at the next 2 stations, inspected at station 4.

Lock slots are milled in rods; rods and caps are countersunk. At the sixth station, oil slot is milled in rods. Next, rods and caps are counterbored and lock holes milled in caps.

At the eighth station bolt holes are semi-finish reamed . . . finish reamed at the ninth. The last station automatically unloads rods and caps to conveyor.

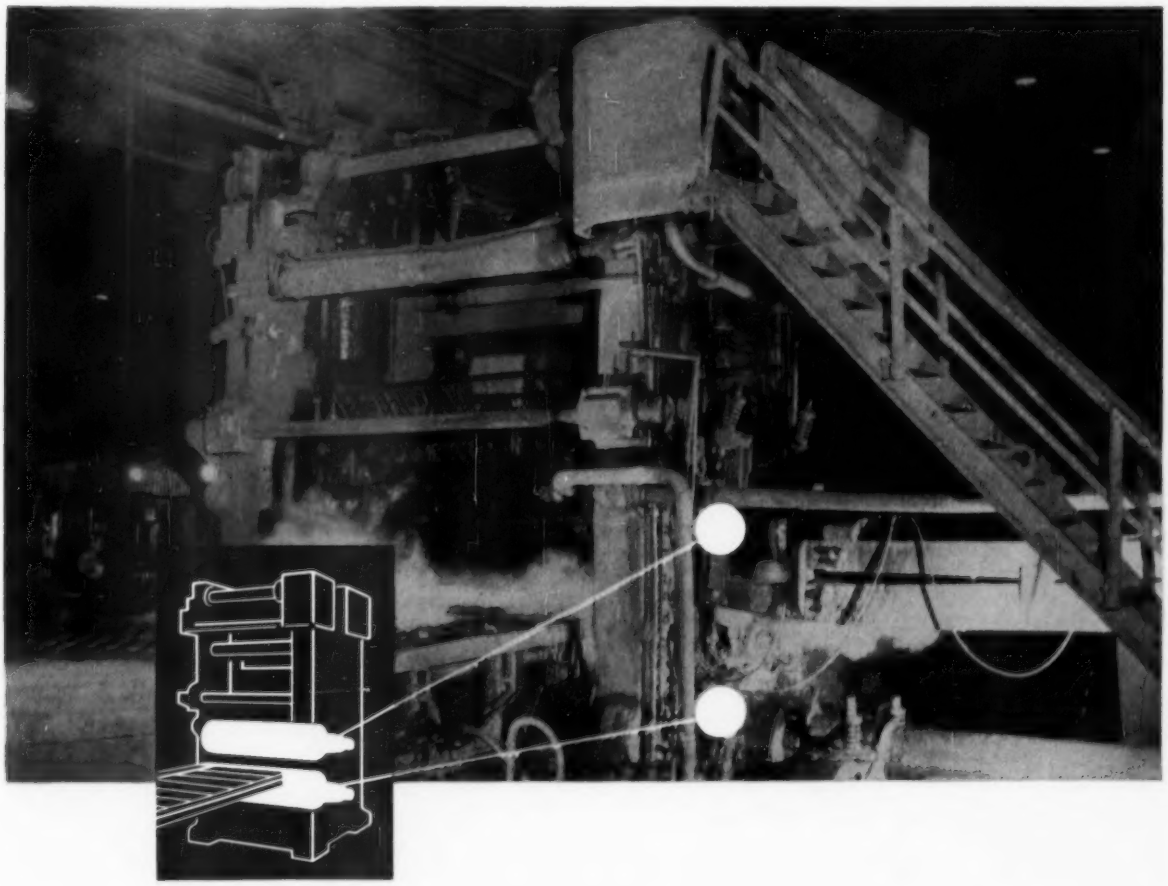
Processing takes place at the rate of 950 rods and caps per hour. Accuracy is greater . . . production is higher than on any other type of machine previously produced.

WRITE FOR BULLETIN SM-457

PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1723 Mason Avenue
Rockford, Illinois

Lubricating roll necks is no easy job



Lubricating the roll necks of a steel mill calls for a lubricant that will resist high temperatures. The lubricant must also function in the presence of steam, water, mill scale and other abrasive materials. It has to cushion great shock loads and cling tenaciously to the bearings it protects. It must last a long time . . . and it must be economical in use.

Atlantic Lubricant 10 performs exceptionally well in this service. It is being used in a pressure system on the mill illustrated, at the Lukens Steel Company in Coatesville, Pa., for the lubrication of roll neck bearings, pinion and spindle bearings.

Selecting the correct lubricant for the job is simplified when you call in your Atlantic Lubrication Engineer. He is a man with years of on-the-job knowledge of heavy industrial lubrication requirements of all kinds.

Why not see for yourself the value of Atlantic service? Just write, wire or phone the office nearest you for full information. The Atlantic Refining Company, Dept. M-7, 260 South Broad Street, Philadelphia 1, Pa.

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SYRACUSE, N. Y.
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ATLANTIC

LUBRICANTS · WAXES
PROCESS PRODUCTS

of machine previously produced.

This Man Knows that "An Ounce of Prevention"* can Save You Money

...He's Your Safety Director

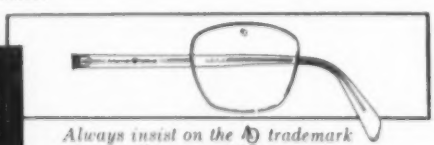
***Here's a Type of Costly Accident He Prevents:**

In a recent case, a machine operator whose eye was permanently injured (loss of vision less than 20 per cent according to medical testimony) was awarded $2,220 — $20 per week for 111 weeks. The wearing of eye protection equipment prevents 99 per cent of these accidents according to the Society for the Prevention of Blindness.

The Safety Director also knows well how to protect worker and company against the hazards of industrial noise, poisonous dusts and vapors and body and limb injuries. He should, he's a specialist!

As a leading maker of quality safety equipment AO† works closely with safety directors in reducing the costs of industrial accidents. If you are considering an Eye Protection program, for example, call us in for complete facts and figures. The program can pay for itself in less than six months!

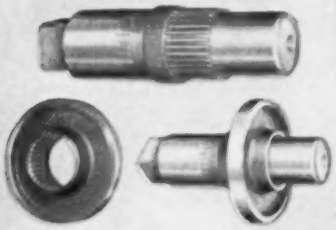
American Optical
SAFETY PRODUCTS DIVISION



Always insist on the AO trademark on safety lenses and frames.

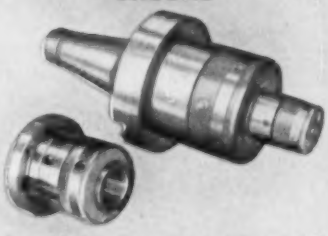
SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

NEW "PIN-TYPE" ARBORS



Permit you to hold squareness and concentricity in accurate relationship with the pitch line of an involute splined bore when facing or turning. Operator rotates the piecepart to actuate arbor. Cams force pins into line contact with adjacent splines at, or near the pitch line . . . locking the piece firmly.

NEW "BETTER-HOLD" CHUCKS



Powerful, accurate centering fit applied easily to a shank type cutting tool by twisting the "lock-and-eject" actuating ring, which draws split collet with tapered OD into compression against mating taper on the ID of the chuck. High holding power and accuracy are extra value features.

NEW SCULLY-DRIFT TOOLS

Here's a simple, foolproof method for ejecting tools from a spindle or holder without hammering. Insert the Scully-Drift at a slight angle to the spindle, and twist slightly to unseat the tool. Reduce tool costs by preventing accidental breakage. No more damage to machine bearings or spindles.

SEE THEM AT THE A. S. T. E. SHOW

International Amphitheatre — Chicago, Illinois, March 19-23

NEW ACCURACY AND EFFICIENCY — FOR PRODUCTION AND ASSEMBLY

PRECISION HOLDING — HEADQUARTERS—BOOTH 488

SCULLY JONES

Scully-Jones and Company, 1902 South Rockwell St., Chicago 8, Illinois

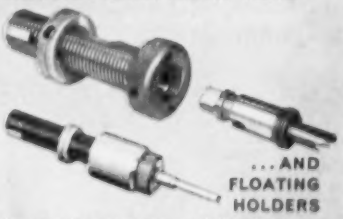
NEW "SAFE-TORQUE" NUT RUNNERS

New, one-shot clutches for hand power tools or assembly machines permit you to tighten nuts consistently, with controlled torque, better than you can set them by hand. Preset torque remains constant. Permit fast, low-cost assembly—with the correct amount of torque every time. Smooth, free-wheeling action reduces operator fatigue.

NEW "SAFE-TORQUE" TAP DRIVERS

Performance proved on hundreds of jobs, they eliminate or drastically reduce tap breakage, and increase production. Provide accurate torque adjustments to suit job conditions. Operate at any speed taps can take without slowdown for blind holes. Help produce uniform, accurate threads. Available for Nos. 3 to 10 tap sizes.

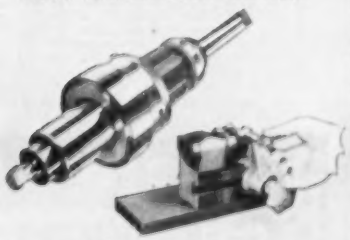
NEW "LOCK-AND-EJECT" ADJUSTABLE ADAPTERS



. . . AND FLOATING HOLDERS

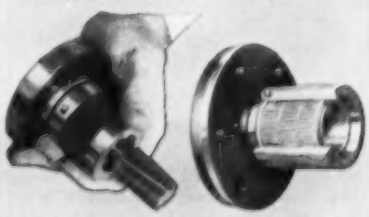
Improved collet action minimizes tool pull-out. Operator merely turns the threaded nut to seat and unseat the chuck. Speed and simplify tool changes. No pounding or torsion needed. Standard on "JT" Floating Holders—optional on adjustable adapters. Extremely wide range of chuck sizes for drilling, tapping, and reaming.

NEW RECESSING TOOLS



Give you high production and hold close tolerances for chamfering, grooving, relieving, back-facing, counterboring, necking, and boring operations. Easily adapted to do all, or a combination, of these jobs on standard machines. New grinding fixture provides accurate method for sharpening and measuring circular form tools.

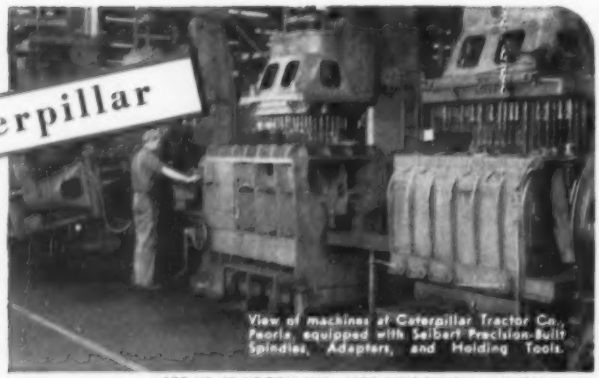
NEW "ROLL-LOCK" TOOLS



Unique operating principle provides accurate, centering shrink fit for chucking parts and tools. Runout is often held within .0001 in., tir. Expanding mandrels or compression-type chucks operate quickly and easily by twisting the actuating ring or cone. Now used on a variety of machining operations, as well as for inspection and gauging.

NEW "TOOLITROL" BOARDS

"Toolitrol" is a new tool control method that co-ordinates and expedites at-the-machine problems of pre-setting, storing, and changing tools in multiple spindle machines. Nonproductive machine time is reduced. Counters help control tool life. Graphic panels permit fast, foolproof identification of tools for each machine station and spindle.



View of machines at Caterpillar Tractor Co., Peoria, equipped with Seibert Precision-Built Spindles, Adapters, and Holding Tools.

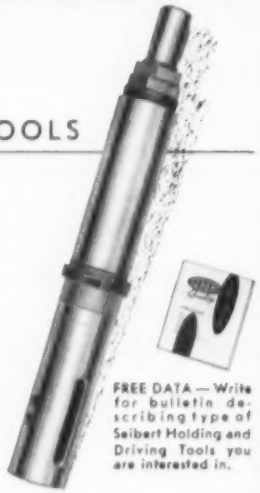
SEE US AT BOOTH 1500, ASTE EXPOSITION, MARCH 19 - 23

12 Year User

OF

SEIBERT PRODUCTION TOOLS

● Like any other reputable manufacturer, large or small, we are especially pleased when the products of our labor are accepted for tests and eventually approved for actual service by a manufacturer or machine tool builder. Yet, being realistic, we know full well this is only the beginning. The acid test comes later, proving our ability to maintain high standards of quality and a constant, dependable service day-in and day-out over a period of years. It is therefore, a source of deep gratitude and satisfaction in that we have, over a period of years, been privileged to serve so many fine companies like Caterpillar Tractor Co. who serve others so well.



FREE DATA — Write for bulletin describing type of Seibert Holding and Driving Tools you are interested in.

SEIBERT **SEIBERT & SONS, INC.** CHENOA, ILLINOIS

Quality MULTIPLE DRILL SPINDLES AND PRODUCTION TOOLS

TWO MIGHTY MITES

The ROTARY TABLE CS-67

has a 5" working surface and a 1½" overall height.

DIVIDING HEAD CS-65

is a standard 40-1 ratio crank indexing. Overall dimensions with 2½-inch 3-jaw chuck — 4" x 4-15/16" x 4⅝".

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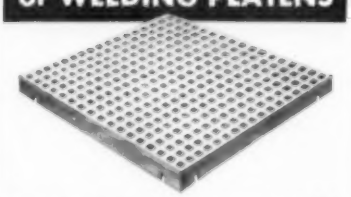

Semi-Steel Blocks for Layout, Welding, Assembly work, etc. Machined working surface: 5 ft x 5 ft, 4 ft x 4 ft, 5 ft x 6 ft and other sizes. Tools and accessories. *Write today for information.*

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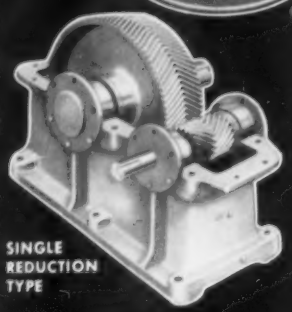
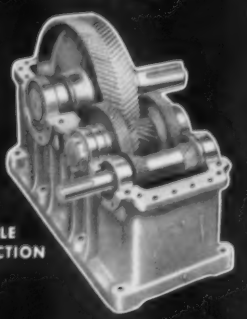
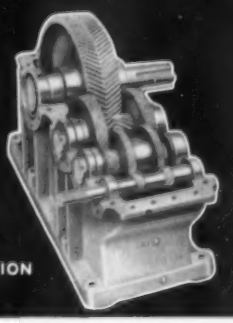
HERRINGBONE REDUCERS ...by PHILLIE GEAR



SINGLE REDUCTION TYPE



DOUBLE REDUCTION TYPE



TRIPLE REDUCTION TYPE

For high horsepower reduction with heavy shock loads, Philadelphia Herringbones are the answer. These quality units are available in Single, Double and Triple Reductions offering wide selection of capacities and ratios. Continuous tooth type herringbone gears assure evenly distributed pressure over each tooth from top to working depth line — which means long life, minimum vibration, quiet operation and maximum transmission . . . Be convinced, send for Catalog H-55.

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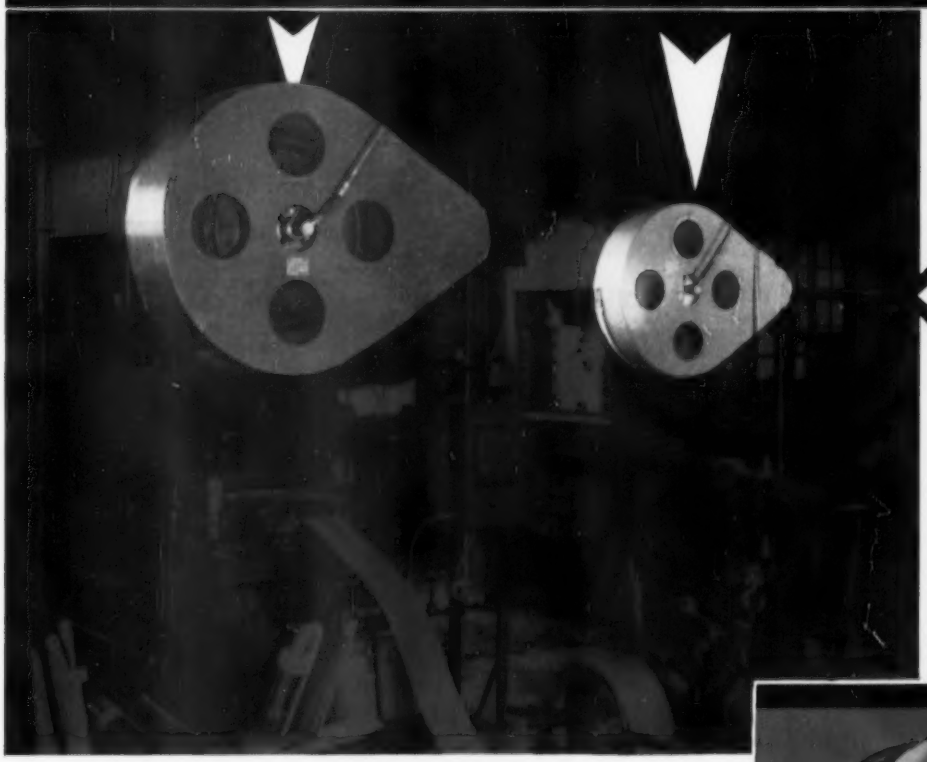
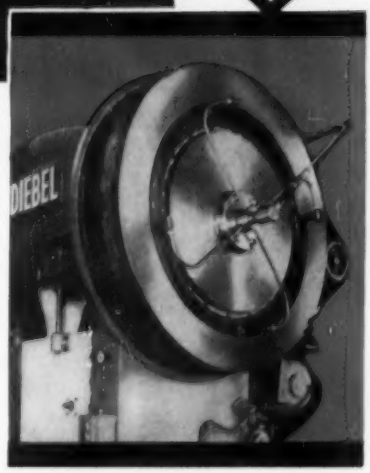
IN THE METALWORKING INDUSTRY



These Diebel 60-ton Automatic Presses are equipped with Fawick Type 22CB500 Clutches and 15CS300 Brakes for faster, more accurate production.

The famous Fawick Type CB Air-actuated Clutch installed on Diebel Automatic Press.



producing SIX days work in FIVE!

That's the record FAWICK-EQUIPPED Diebel 60-Ton Automatic Presses are making for a large Midwest manufacturer of electric components.

FAWICK Airflex Clutch and Brake units and Controls contribute importantly to other records produced by these outstanding Diebel Automatics! Reports from the user state:

"... 30% increased production between die grinds"
"... 30% reduction in labor costs on laminations"
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"... maintenance costs are next to nothing"

These are typical of reports from operators of FAWICK-EQUIPPED metalworking machines throughout industry.

If you are interested in better production at lower cost, investigate the outstanding advantages of FAWICK products today. Simply call or write the Home Office or your nearest FAWICK representative.

Remember—"*It works best when* FAWICK-EQUIPPED"

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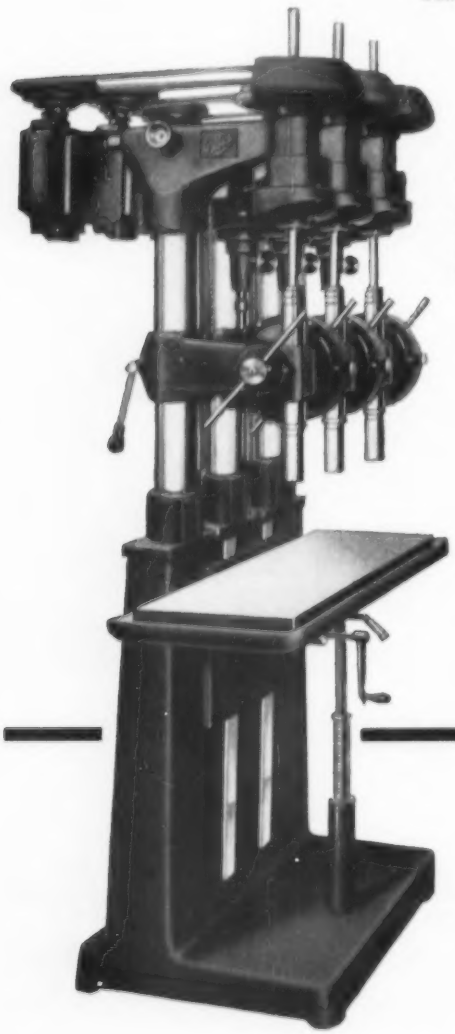
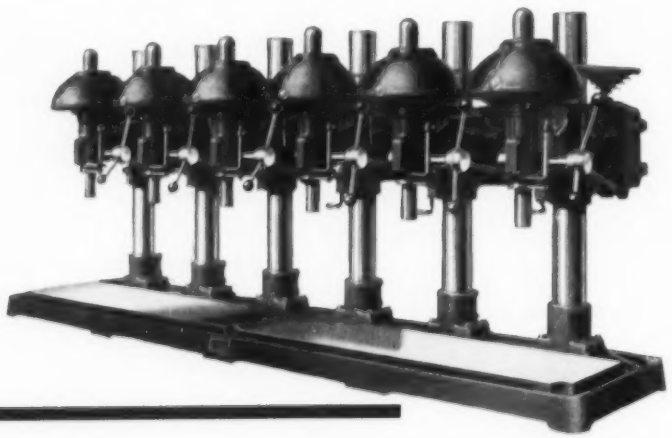
HIGH-SPEED PRECISION PARTS DRILLING—"Buffalo" No 14 Drills are high-speed, precision machines with capacity from the smallest commercial drill sizes up to ⅛". Spindles are alloy steel with adjustable alloy steel sleeves for lasting accuracy. Full range of single or multiple bench or floor models. Write for Bulletin 2730G.

⅞" CAPACITY DRILLING—SENSITIVE OR POWER FEED—There's no better value in a ⅞" drill than the "Buffalo" No. 16! In 8", 12" or 15" overhangs with speed range from 400 to 3000 r.p.m. Round column, floor type, bench and pedestal models, 1 to 6 spindles. Top grade machines for easy operation and long life. Write for Bulletin 2730G.

RUGGED ½" JOB AND PRODUCTION DRILLS—"Buffalo" No. 15 Drills are built for heavy production work, with full strength and rigidity. Extremely wide choice of models—tapping and slow speed attachments, tilt tables, radial drills, bench and floor single and multiple spindle models. Write for Bulletin 2963G.



HEAVY-DUTY PRODUCTION DRILLING UP TO 1"—"Buffalo" No. 18 Drills are built in a choice of 19 models to meet the most particular requirements . . . choice of feeds and table arrangements . . . 1 to six spindle models, bench and floor types. Precision ground spindles of chrome-nickel alloy with adjustable sleeve bearings for lasting accuracy. Bulletin 3123.



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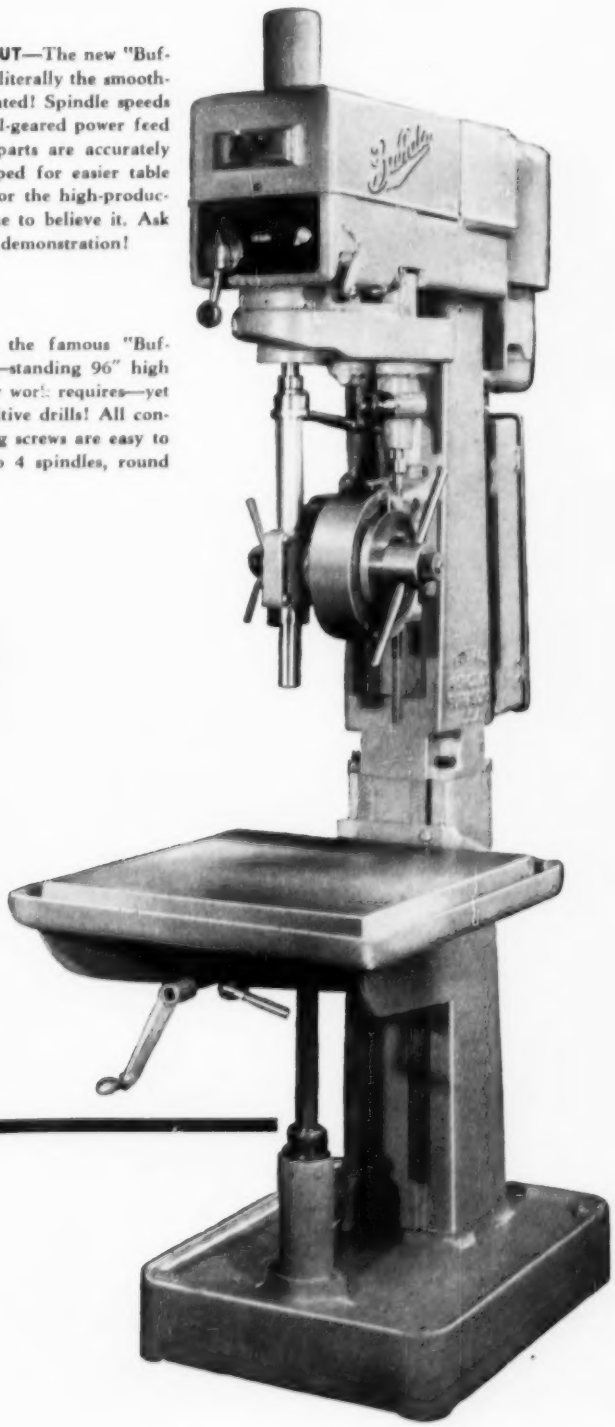
PARTICULAR REQUIREMENTS

THE DRILL WITH "EVERYTHING" FOR HIGH OUTPUT—The new "Buffalo" RPMster with adjustable-speed gearless drive is literally the smoothest, most convenient drilling machine you ever operated! Spindle speeds from 100 to 3,000 r.p.m. are adjusted in seconds. All-geared power feed reduces operator fatigue and margin of error. All parts are accurately machined and precision fitted. Ways are hand scraped for easier table adjustment. Here is the ideally accurate time-saver for the high-production shop—you have to see and operate this machine to believe it. Ask your "Buffalo" Machine Tool Dealer for details and demonstration!

LARGE CAPACITY—HIGH PRODUCTION—Here's the famous "Buffalo" No. 22 Drill with capacity up to 1½" drills—standing 96" high and built with all the strength and rigidity this heavy work requires—yet which is as easy to set up and operate as small, sensitive drills! All controls are within easy reach. All table and head-raising screws are easy to operate—all ways are hand scraped. Choice of 1 to 4 spindles, round column or pedestal. Write for Bulletin 2989G.



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BUFFALO, NEW YORK

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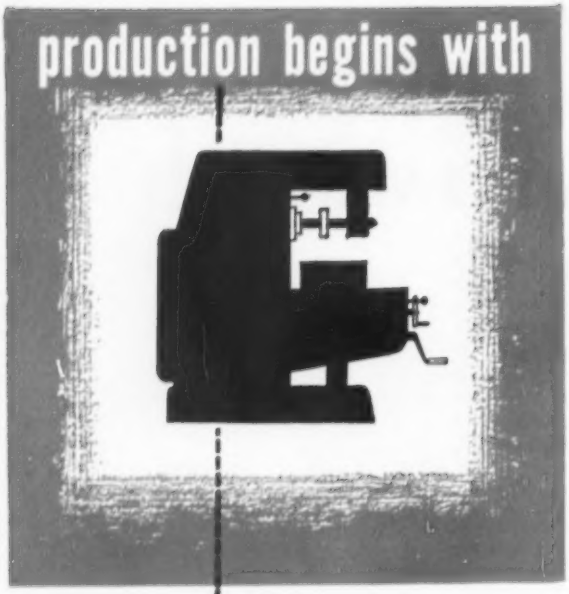

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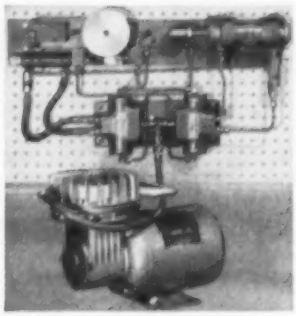

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works automatically to give bore-to-bore size control over every piece honed, making each interchangeable with the others. Sizing is not affected by misalignment or eccentric stone wear.

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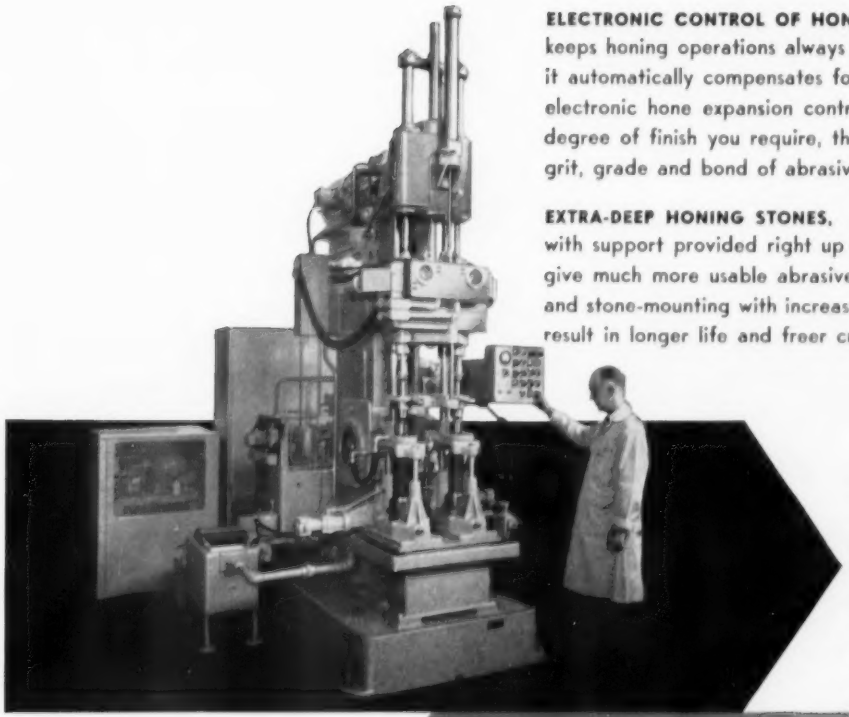
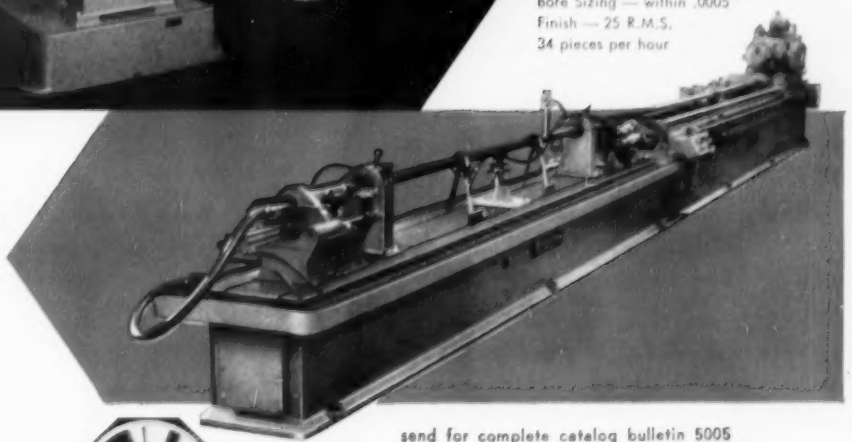
with support provided right up to the cutting edge, give much more usable abrasive. Improved body design and stone-mounting with increased cutting edge support, result in longer life and freer cutting action.



No. 307
VERTICAL HONING MACHINE
Job Specifications:
Steel Hydraulic Cylinders
Bore — 3.000" I.D. x 10½" length
.012"/.017" stock removed
Bore Sizing — within .0005"
Finish — 25 R.M.S.
34 pieces per hour



No. 38
HORIZONTAL HONING MACHINE
Job Specifications:
Steel Tubes
Bore — 1.500" I.D. x 10 ft. length
.012"/.016" stock removed
Bore Sizing — within .0005"

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CUTS ALUMINUM AT SPEEDS UP TO 300 INCHES PER MINUTE

HELIARC cutting, a new process developed by LINDE, brings all the desired features of economical high-speed operations to the cutting of aluminum.

★ **Speeds never before possible:** Normal mechanized cutting speeds are 300 in. per min. in ¼-in. material, 125 in. per min. in ½-in. material, 75 in. per min. in ¾-in. material, and 50 in. per min. in 1-in. plate. If desired, lower speeds can be obtained by simply adjusting the controls.

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HELIARC cutting employs a high-temperature, high-velocity, constricted arc between a tungsten electrode and the piece to be cut. The concentrated, columnated energy of the arc stream melts and ejects a thin section of metal to form a kerf. The gas atmosphere (a combination of argon and hydrogen) prevents oxidation of the cut face.

Learn the details of how HELIARC cutting can help you increase production and cut operating costs. Call your LINDE Representative today.

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Models 400 and 600 Erickson Speed Indexers. Standard index plate provides 4, 6, 8, 12 and 24 positions; special parts provide up to 50 positions on Model 400, up to 100 positions on Model 600. Other models available.

Angular accuracy within 2 minutes... repetitive accuracy in low "tenths" of a thousandth

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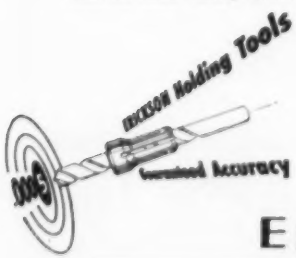

ERICKSON INDEXERS—

the economical way to smash automation bottlenecks

Even the most elaborate automatic production line can bog down *expensively* without rapid and accurate automatic parts positioning.

That's where Erickson Indexers really pay off. For you can interlock them into your production set-up with micro switches and solenoid valves. The hardened and ground lock pin operates in conjunction with the actuating mechanism to assure *positive positioning and angular accuracy within 2 minutes of a degree.* (Repetitive accuracy is no indication of angular accuracy. Erickson holds repetitive accuracy in low "tenths" of a thousandth.) And Erickson Indexers can maintain this great accuracy because their adjustable, self-contained shock control unit delivers a cushioned rotary load to the mechanism, thereby reducing wear.

Speed to keep lines moving . . . acouracy to reduce rejects . . . long life to cut maintenance and capital investment—all add up to Erickson Indexers, the *economical* way to smash automation bottlenecks.

Write for Erickson Catalog K today! You'll find many interesting applications for all Erickson holding tools. Take advantage of our free engineering service. An Erickson field engineer will gladly work with you for production economy.

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The New Northfield Model K-6 Keyseater is designed to cut straight or tapered keyways from ⅛" to 1" wide. Work of any shape and diameter can be clamped to the table and cut, grooved, or slotted.

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35 Types & Sizes

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Popular package is 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

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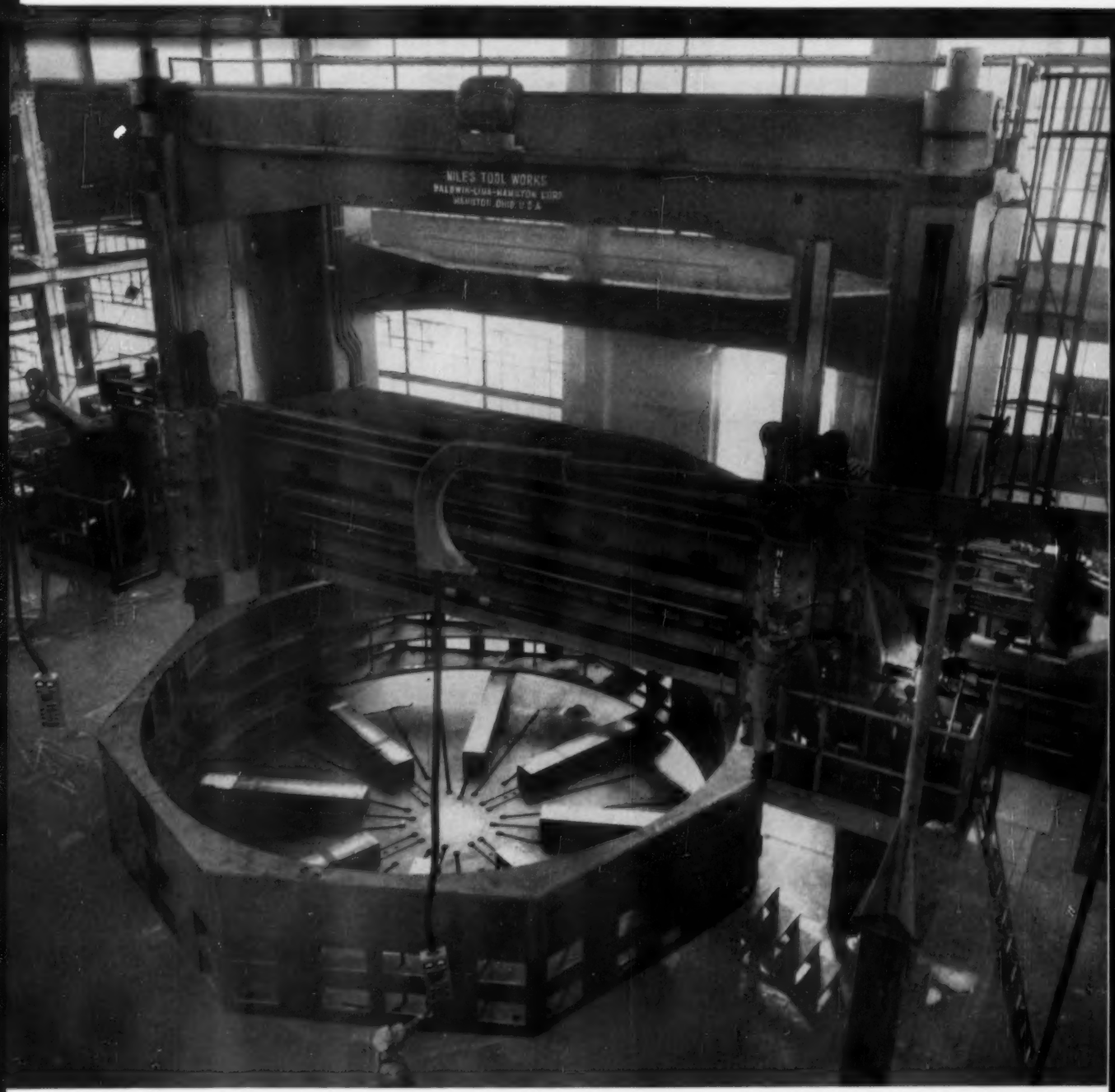

35-year performance payoff

sells Elliott new Niles 30-ft. boring mill

The remarkable performance since 1920 of a Niles 20-ft. vertical boring mill was responsible for Elliott Company's selection of a new, modern Niles 30-ft. mill. Installed primarily for machining blowers, turbines and condensers built at their Jeannette, Pa. plant, and large generator stator frames for their Ridgway Division, this large vertical boring mill is also available for outside contract work.

The new Niles has a 16-ft. clearance under the crossrail. It's equipped with two 9-ft. travel rams and a 19-ft. 6-in. table. Other features include electronic feed control and electrically operated clamps which minimize set-up time and hold settings rigidly accurate. Special counter weights on the rams take up backlash in the feed gears at all times. This insures maintaining dimensional tolerances within .001 and .002 across large surfaces.

Elliott also expects to use such other features as compound feeding and 60° swing of the boring rams to install electronic-hydraulic duplicating equipment on the mill. This will enable them to do contour or profiling work, thus increasing the machine's versatility and adaptability for a wide variety of work.

You too will find that the many exclusive features of Niles machine tools add up to greater production and higher quality. For further details write today. Hamilton Division, BLH Corporation, Hamilton, Ohio.

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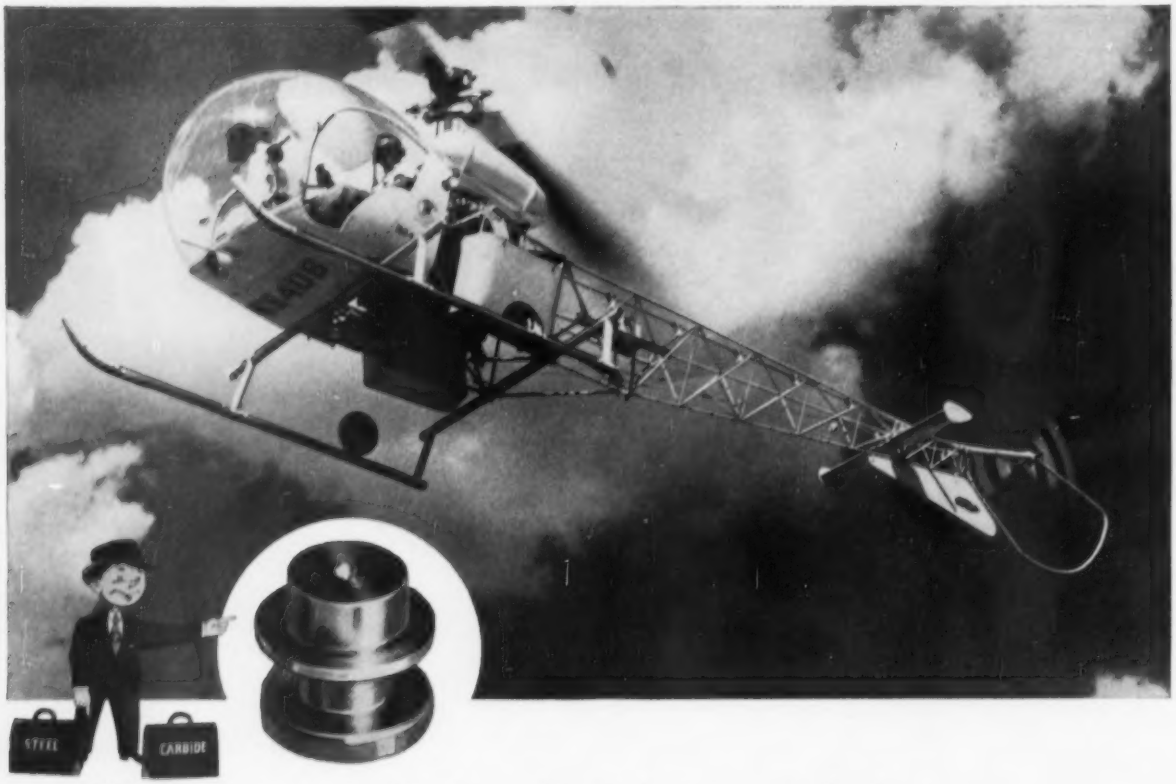
"Mission accomplished" at Bell Aircraft...with FIRTHITE TXH



133% more needle bearing pins per grind

Down Fort Worth way at famous Bell Aircraft Corporation, they made production tests on the *new* FIRTHITE TXH Carbide . . . turning and facing needle bearing pins from SAE 4140 steel.

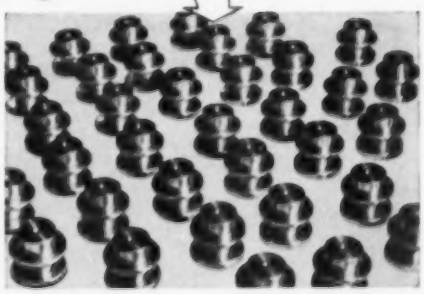
The results speak for themselves:

- 133% more bearing pins per grind.
- More than twice as many pieces per grind as nearest premium grade.
- Seven times more pieces per grind than two other competitive grades.
- Only .007 stock removed to resharpen compared with .025—.035 for competitive grades.

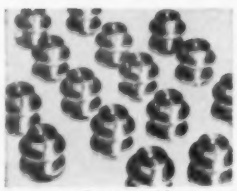
Truly this test proves, as do others all over the country, that FIRTHITE TXH is easily the outstanding carbide in its field . . . a *premium grade* at *no* premium price.

Yes, FIRTHITE TXH is a completely *new* carbide concept . . . a combination of materials and processes designed specifically to do heavy-duty, high-production cutting operations better than they have ever been done before!

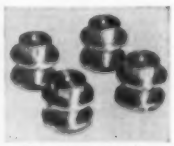
You, too, can make important savings, and increase production with TXH. It's available *now* in all standard tips and tools. Try it today.



FIRTHITE TXH—35 PER GRIND



Competitive Grade A—15 per grind



Competitive Grades B & C—4-5 per grind

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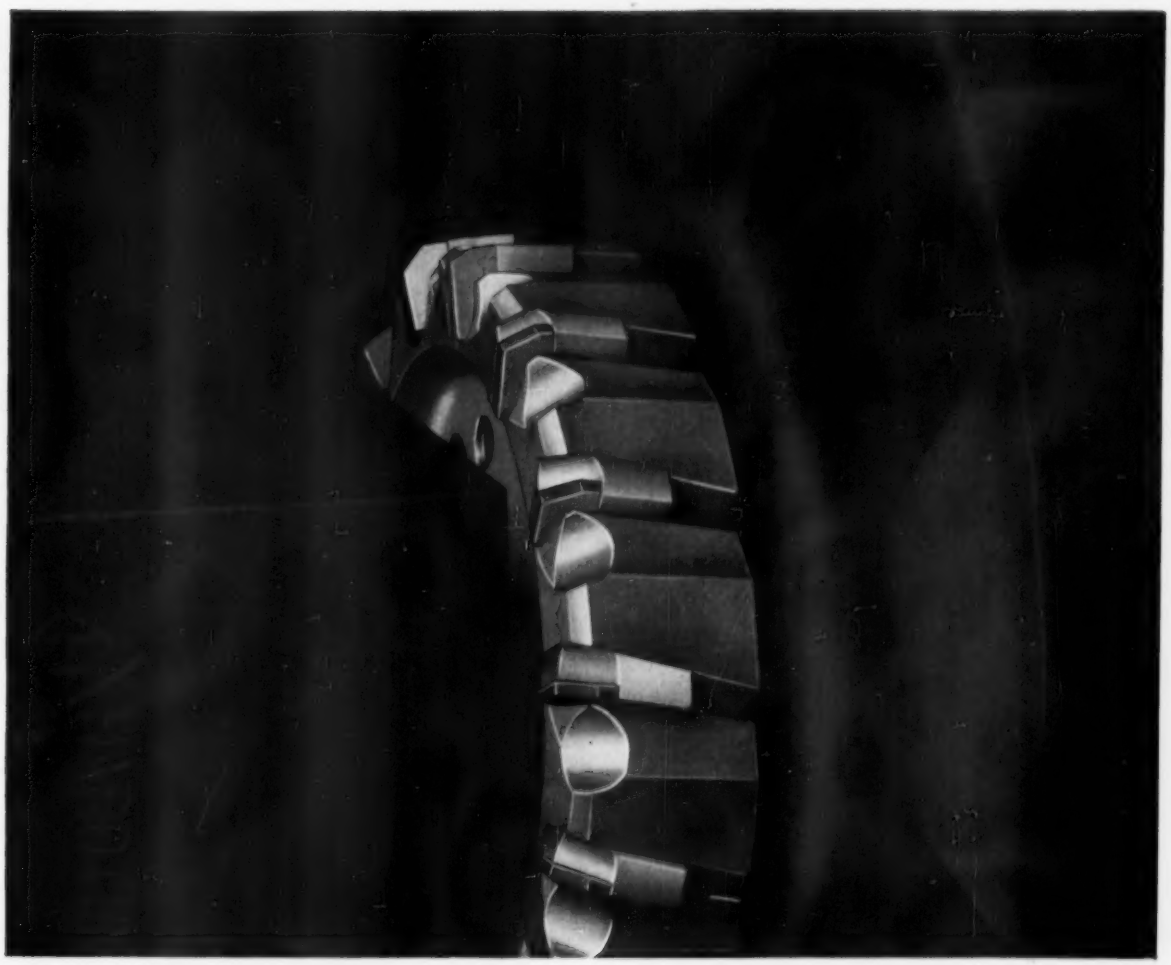

How Heppenstall's hogmill forged die blocks with OK facemills

Close-up made at Heppenstall's Bridgeport shows a 1500 pound, 12 x 20 x 20 inch, Hardtem B forged die block being rough milled with a 14 inch O K 9614XX, extra heavy-duty carbide insert blade facemill, incorporating 10 degree negative axial and radial rake angles. Feed, 150 surface feet per minute. Speed, 8½ inches per minute. Depth of cut, ¼ to 5/16 and often up to ½ inch. Machine, a rebuilt vertical miller with 60 horsepower motor and heavy fly wheel.

IT IS THE SAME STORY EVERYWHERE. Tool engineers prefer O K carbide insert blade cutters for all kinds of tough milling operations . . . facing steel forgings, die blocks, locomotive driving rods, steel castings. There's a reason for this preference. It can be demonstrated by counting the minutes and measuring the metal removed. O K cutters are scientifically designed with various combinations of positive and negative axial and radial rake angles. Scientific designing directs the cutting forces into the body of cutter instead of transversely to the cutting edges. This is necessary because carbides have high compression strength and low transverse rupture strength.

O K cutters are the simplest, the strongest and the toughest ever built. They are heavier, huskier, with more beef in the body. The simple two-piece construction — body and blade — provides more strength and weight to better stand the heavy pull of high powered modern milling machines. Blades are wedge-shaped blocks, the wedge being the strongest mechanical device man has devised. One side of each blade is serrated. Matching serrations are cut into the body. Blades are self-locking, cannot tip or slip. No pins, screws, gibs or locks are needed. To compensate for wear, blades are stepped out one serration and reground. A new set of blades gives you a new cutter. Put your milling problems up to our tool engineers. Write for Catalog 13.

See you at the Tool Show, Booth No. 633

OK

modern milling cutters for modern milling machines

THE OK TOOL COMPANY, Milford, New Hampshire

Grant Speed Reducers

YOUR ASSURANCE OF BETTER PERFORMANCE

The *real* criterion for reduction units is unfailing performance over the years, with minimum maintenance. Our files show many cases where Grant Reducers are still providing every-day service, after two decades, without a breakdown.

What's back of such performance? Extra-quality features built into each Reducer, by gear experts . . . totally enclosed cast iron housings, radial thrust ball bearings, precision high-test bronze gears and worms of chrome vanadium steel. These features mean money in your pocket through trouble-free operation.

Grant manufactures a complete range of types and sizes — worm, double worm, compound worm and spur, helical and mitre gear — with reductions up to 3660-1 — most available from stock. Write for the latest catalog, describing each type in detail.

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SPEED REDUCERS

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Handle your small part precision JIG BORING on the LINLEY JIG BORER

Why tie up your big, costly jig borers on small work when you can get maximum utility at less cost per hour on a machine exactly fitted to your work. Put your small work on the LINLEY where it belongs and reserve your large machines for large work, where large work belongs. You'll save money this way.

SPECIFICATIONS

Table Movement: 6" x 10" — Table Size: 7" x 17½"

Complete details sent promptly on request

LINLEY BROTHERS CO.
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Your Victor Distributor will especially want to tell you about Victor "Moly"® High Speed steel blades. He'll tell you that "Moly" blades can save you real money because they outlast standard steel blades 10 to 1, cut as well as the *best* high speed steel blades made, and yet are substantially lower in cost!

And be sure to ask your Victor Distributor for a supply of our NEW Metal Cutting Booklets and Wall Charts. They're packed full of interesting information.

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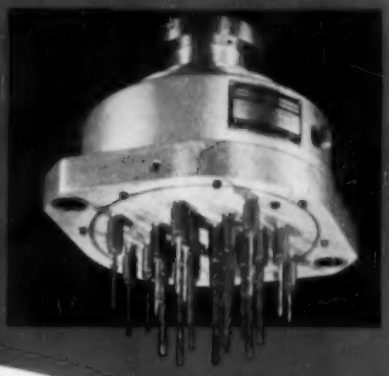
MAKE ZAGAR your HOLE CENTER FOR DRILLING, REAMING AND TAPPING . . . . . .



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We're at the ASTE SHOW, Booth 179

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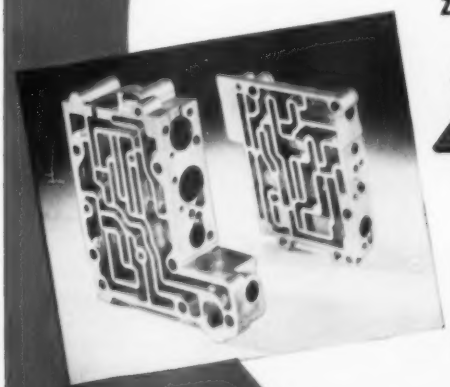
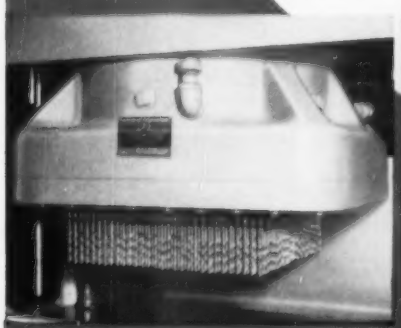


Any machinable material — from all angles.



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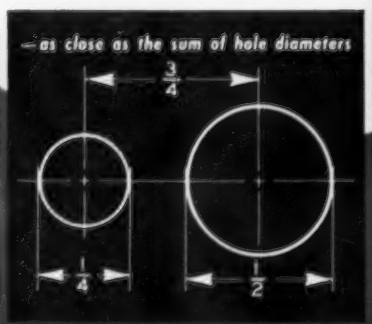

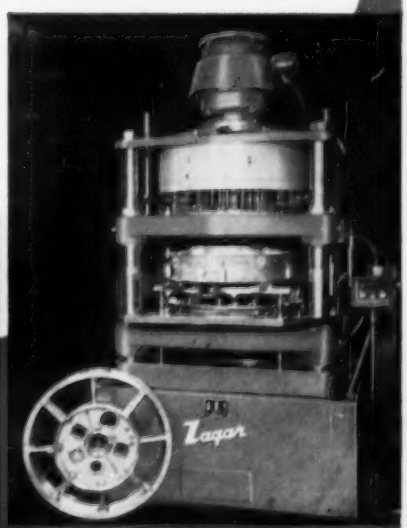

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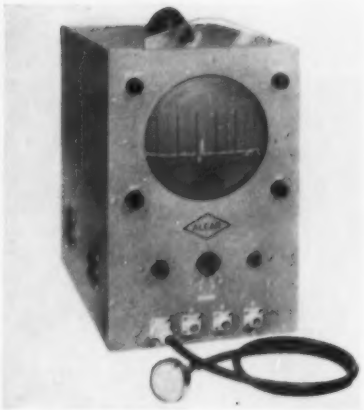

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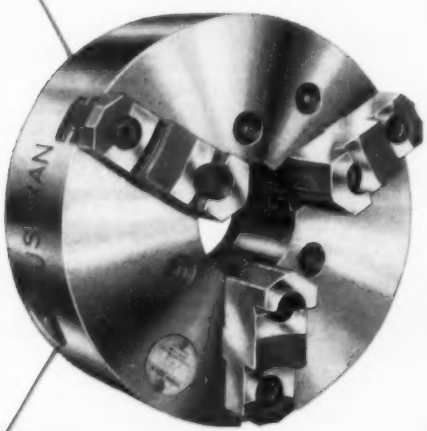

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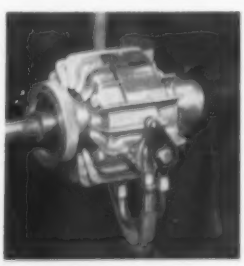

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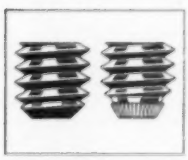

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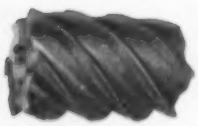

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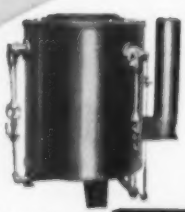

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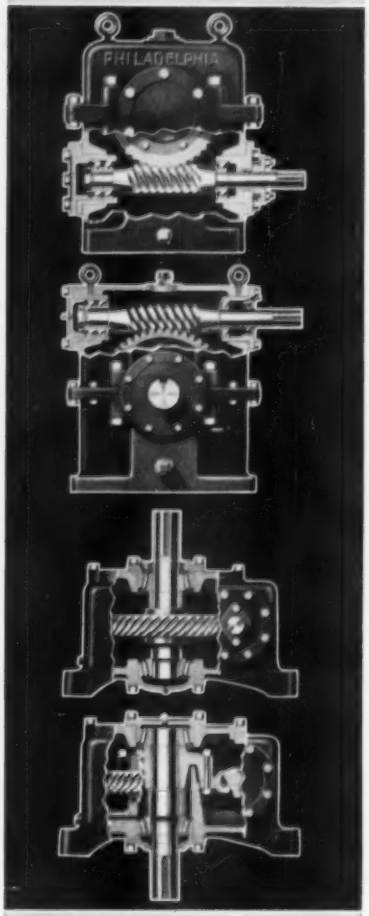

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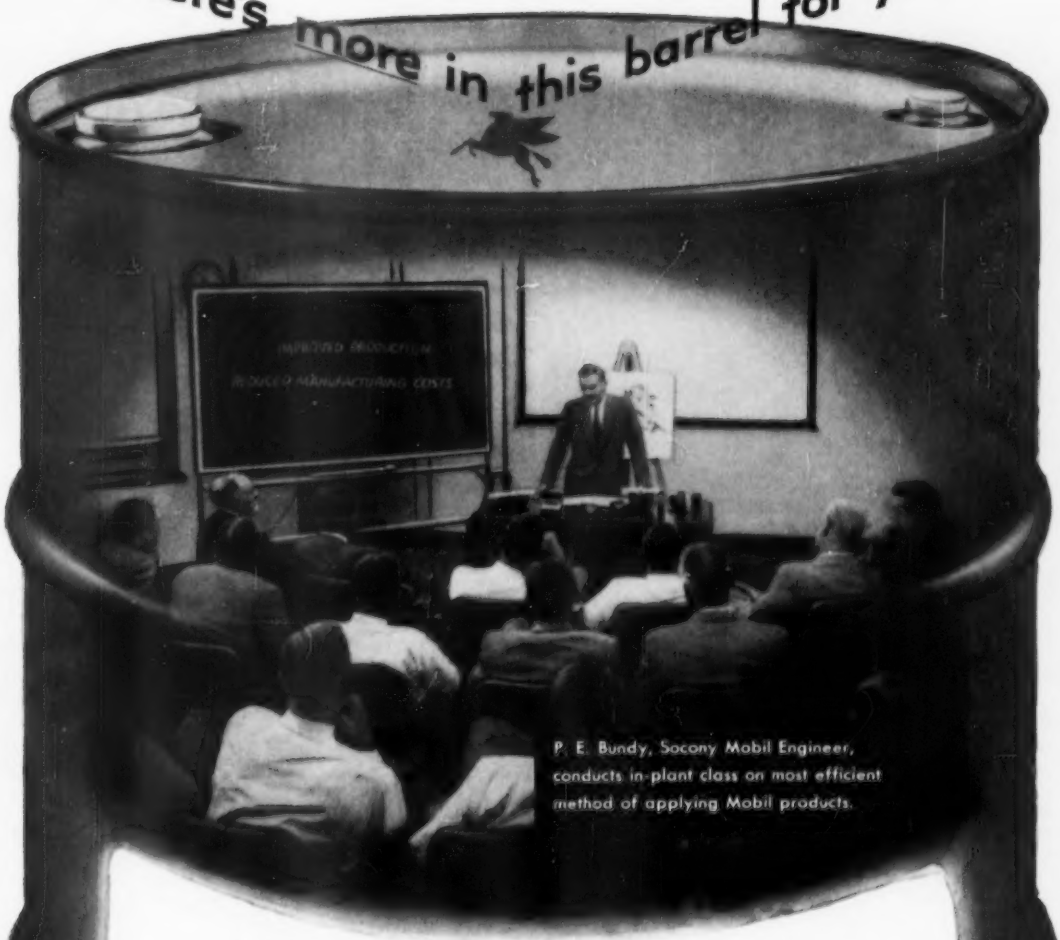

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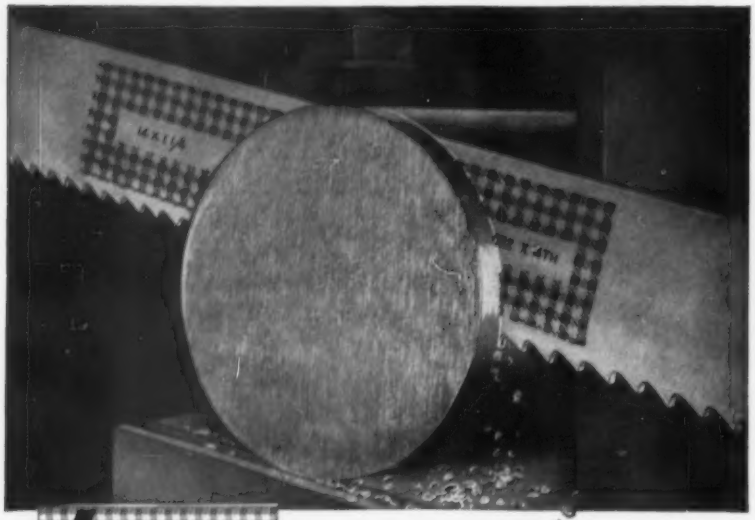

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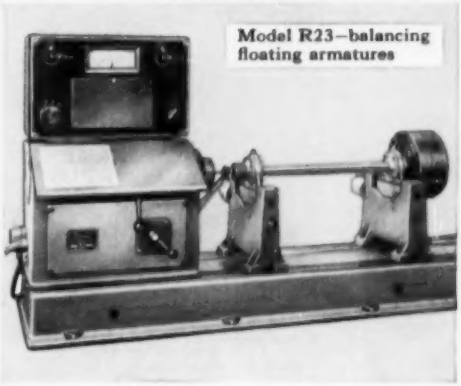
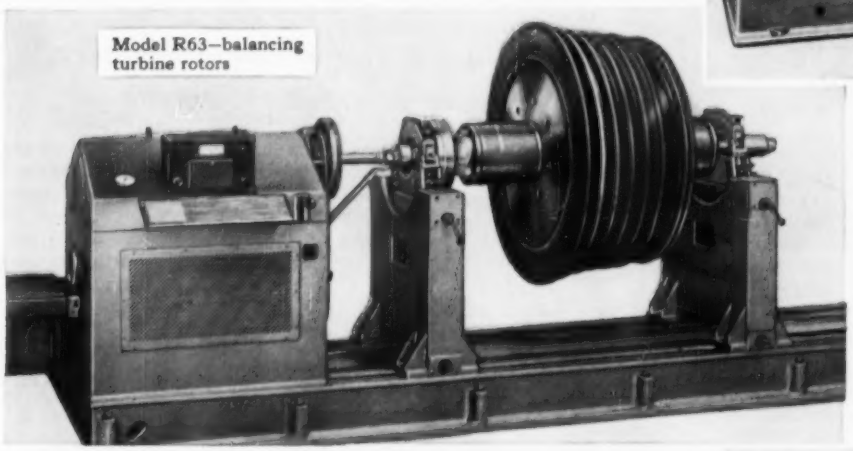


Model R23—balancing floating armatures



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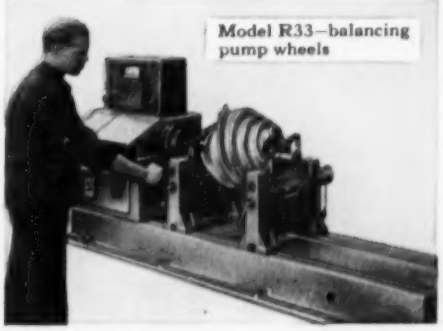

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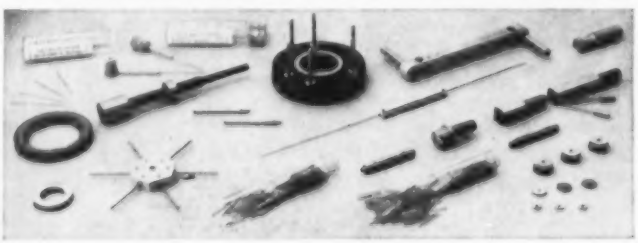

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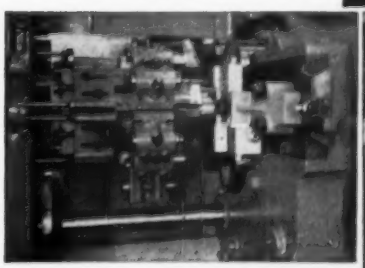
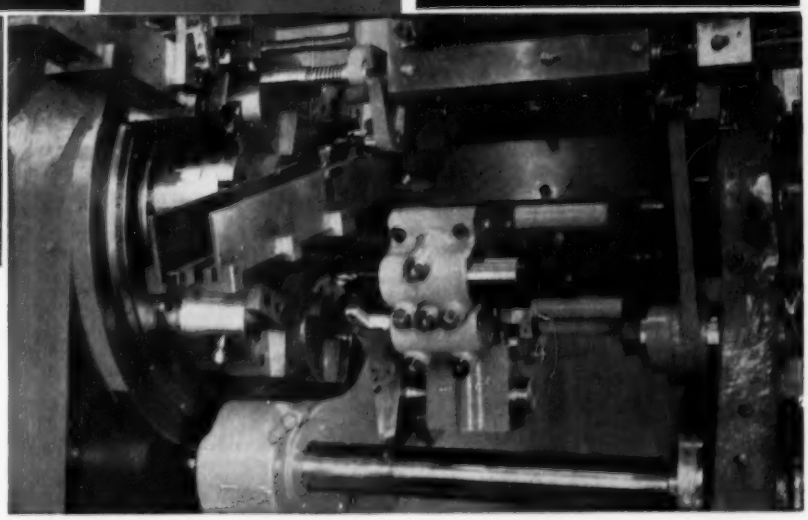
OPERATIONS:

Automatically load. Rough and finish turn O.D. Drill, true bore and ream the small hole concentric with O.D. Face and chamfer end. Chamfer holes. True bore the counterbore. Trepan bottom of counterbore and automatically unload. Illustrations also show rough castings as fed to machine.



(Above) REAR VIEW OF TOOLING

(Right) FRONT VIEW OF TOOLING Showing load chute at upper left . . . and unload chute at center . . . both at same station.



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- 24" between centers (also available in 40" centers)
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"You say I can see vibration, measure it, and eliminate it?"

1 "How much vibration do you think my machine has?"

No need to guess—the Veelos Vibration Analyzer shows exactly! This amazing electronic tester measures vibration amplitude down to *2-millionths of an inch*—tests one belt against another, actually shows which belt has "invisible shakes" . . . and how much! Don't guess about vibration; it's costing you hard cash every minute you ignore it. Ask your Veelos salesman to test your belts with the Vibration Analyzer.

2 "Isn't vibration caused by a number of things?"

Vibration can be caused by bearings, motor, clutch, sheaves or V-belts. Quite often it is caused by V-belts alone. The Veelos Vibration Analyzer uses a "strobe" light which "stops" the motion—shows exactly *what* is vibrating! It shows you precisely how much vibration you're paying for, and lets you correct it. The Vibration Analyzer gives positive proof, and the test takes only 15 minutes. It's free, of course.

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Install Veelos, in place of ordinary V-belts! V-belts have spots of varying density, due to their construction, which throw them out of balance. Veelos belts are absolutely uniform; every stud and link is identical; *every foot of the reel* is identical and uniform; and they're perfectly balanced! Test any belt for vibration against Veelos—you're in for a shock. Your Veelos salesman will show you how to cut costs and improve your operation.

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VEELOS
THE BALANCED
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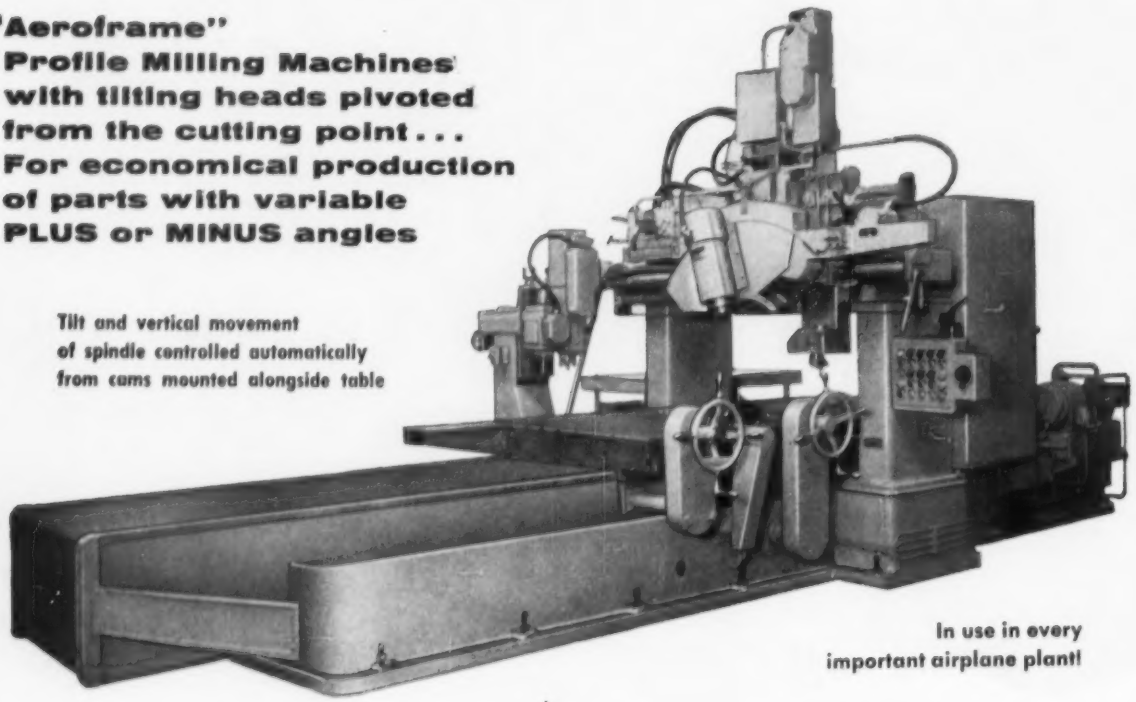
"Aeroframe" Profile Milling Machines with tilting heads pivoted from the cutting point . . . For economical production of parts with variable PLUS or MINUS angles

Tilt and vertical movement of spindle controlled automatically from cams mounted alongside table



In use in every important airplane plant!

MOREY | "AEROFRAME"

PROFILE MILLING MACHINE

The Morey "Aeroframe" Profile Milling Machine does yesterday's "impossible" jobs *today*. Designed for fast production milling from heavy plate and forging of complex structures and swarthing struts used in aircraft construction.

More than 175 Morey heavy duty 50M machines are in successful operation—thousands more in the smaller sizes. The production chief of one large East coast aircraft plant says of his battery of Morey profilers: "We have been able to increase our production at least three to one over the conventional machine practice on the same part!"

The *new* Morey 50 MA "Aeroframe" Profile Milling Machine, equipped with 20/40 HP motors and with a speed range from 44 to 4800 RPM, is ideal for milling of aluminum, cast iron, steel or titanium.

Morey profilers are available with electric or hydraulic, pencil type and automatic copying . . . Also hand feeds.

Custom-built with standard components with heights, widths and table lengths *to suit the job.*

Want completely detailed information? Write now to Dept. AM.

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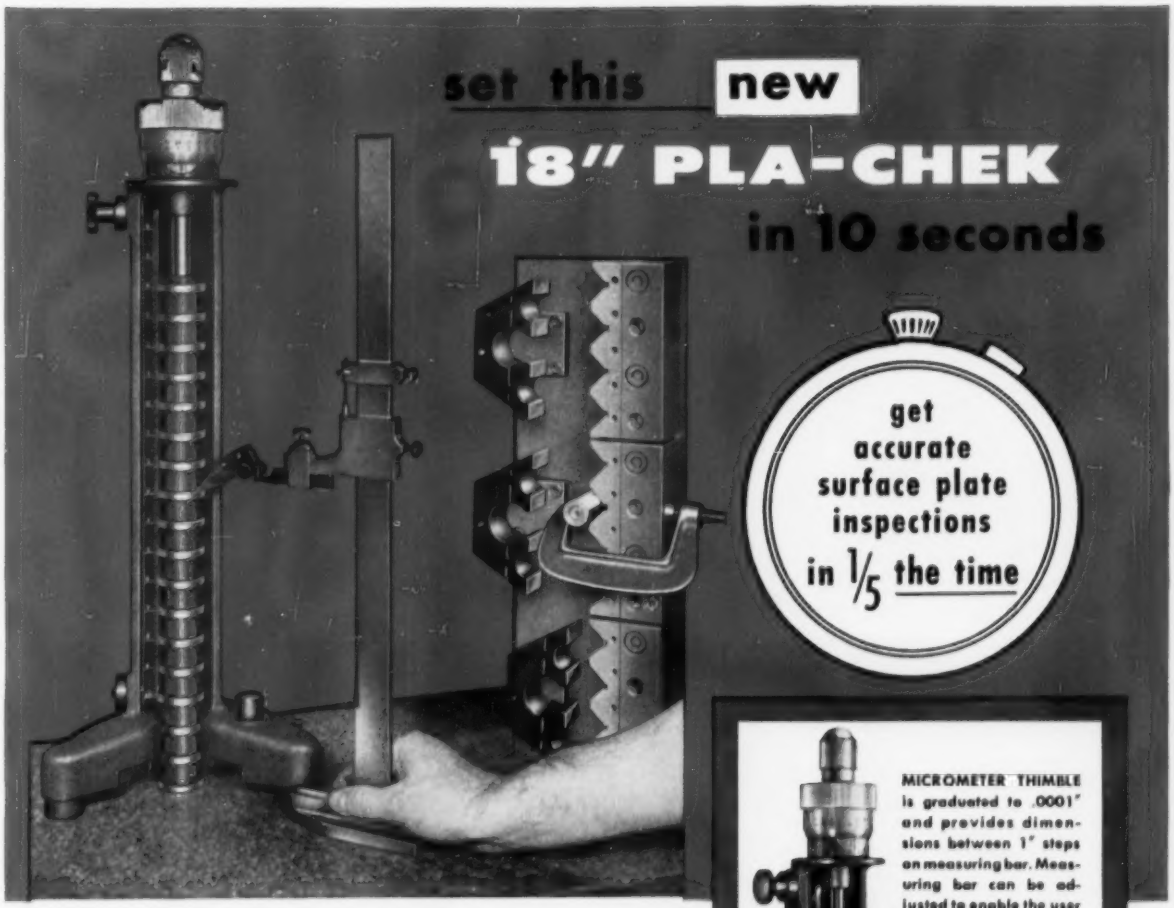

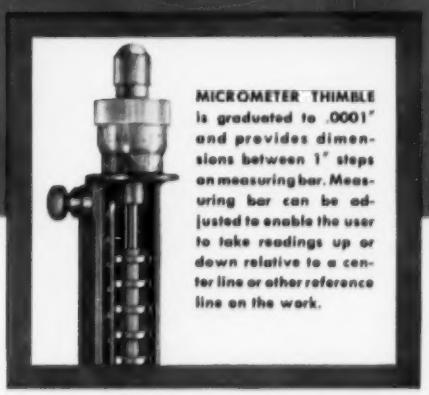
MICROMETER THIMBLE is graduated to .0001" and provides dimensions between 1" steps on measuring bar. Measuring bar can be adjusted to enable the user to take readings up or down relative to a center line or other reference line on the work.

accurate to .00005" throughout the 18" range

That's right! Just 10 seconds to set this NEW 18" PLA-CHEK GAGE . . . and you are ready to start your inspections. In hundreds of installations on innumerable jobs PLA-CHEK GAGES are daily proving their time-saving and money-saving advantages. Extremely easy to operate—no auxiliary gage blocks are necessary—this PLA-CHEK 18" model guarantees accuracy to fifty millionths through its entire range. The measuring bar is made of deep-frozen, strain-free alloy steel. Because it is of one-piece construction the steps cannot change or separate with age. Since it is not necessary to touch the measuring bar, body heat does not affect it. Return the coupon or write TODAY for literature and complete details.

Cadillac PLA-CHEK GAGES are available in a complete range of sizes: 6", 12", 18", 24", 36", and 48" models. Precision-made risers, increasing the range of each model, are also available.

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Now any infrared reflector bank can be equipped with glassless, glareless, self cleaning Metaray elements. Radiation is uniformly spread in a figure 8 pattern.

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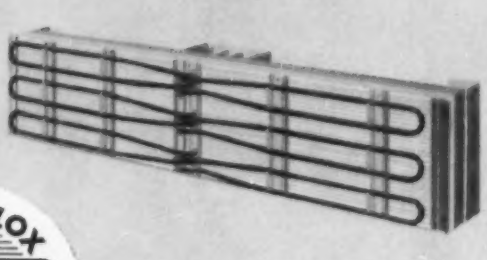
MODULAR RADIANT PANELS

A high-intensity, accelerating heat source. Four standard, modular panels completely factory assembled with built-in continuous bus, reflector, insulation, frame and mounting. Lets you tailor heat source exactly to process requirements.

Ask for Bulletin CS-606



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FIRST NAME IN ELECTRIC HEAT

RADIANT HEATERS

For assembly in banks. Two bolts to hold it; two wires to connect it. Six standard lengths, 14 standard wattages. Housing is rigid extruded aluminum with brightly polished parabolic non-oxidizing reflector.

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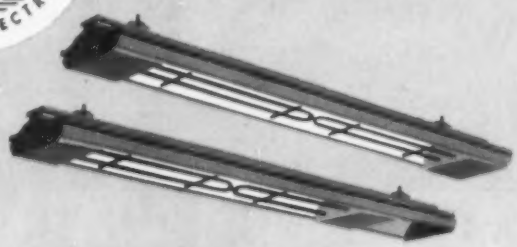

ADJUSTABLE AREA RADIANT HEATERS

The new Chromalox URAD lets you match heat source to the work area. Choose one basic housing for your largest work. Into the housing you install any of 6 different heated lengths as your present work requires.

Ask for Bulletin CS-607

4 ways to put Far-infrared to work!

When you want reduced processing time, more uniform pre-heating, curing or pre-drying, or increased heating capacity on existing equipment, put Chromalox Far-infrared on the job! The long wavelength makes the difference.

With small capital investment, flexible Far-infrared goes to work on the most difficult heat problems. Output is infinitely variable from 4 to 100% of capacity. Chromalox Far-infrared covers the work in a uniform pattern, unmatched by other heat sources.

You never worry about breakage to spoil work in process. The Chromalox metal-sheathed generator is industry's most durable Far-infrared heat source. Nothing to shatter, break. Impervious to hard knocks, steam or splashed liquids.

Contact your Chromalox representative for helpful information on Far-infrared for your application.

Edwin L. Wiegand Company

7577 Thomas Boulevard, Pittsburgh 8, Pa.

High-Speed Steel Saw Bands Bring Big Profits to Cut-Off Operations!

The figures at the left cover just one typical example of the greatly increased cut-off efficiencies made possible by DoALL's new Demon *high-speed steel* saw band on DoALL's new Power Saw.

Performance records from industry prove that plants large and small make big profits on their cut-off work with this new blade and machine combination. They do more accurate work, faster and with less waste of material. They have no trouble meeting production schedules and they often can replace two or three machines with one new DoALL unit.

See the new Demon saw band in operation at your plant — demonstration is free. Just call your local DoALL Store or write:

THE DoALL COMPANY, Des Plaines, Illinois

Makers of Machines and Blades—they go together!

DoALL

Get your copy
"SAWING SAVINGS PROGRAM"
See how DoALL's personalized service is designed to save you money in all your sawing operations.

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Cut-off sawing operations—108 pages of "how to do it" at lower costs.

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160 pages of saw selection—cutting rates for materials.

Friendly DoALL Stores (in 38 cities)
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SB-40R

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FOR RIGIDITY . . . FOR PRECISION
FOR LOW COST PRODUCTION

Developed to meet the demands of progress in cutting tools, drives and electrical innovations, the FB Series offers the utmost in rigidity and precision. The wide well braced bed, the massive round column support for the headstock, and the conventional intergrally cast column at the rear, concentrically support the boring spindle, preventing any deflections, to provide the maximum in precision.

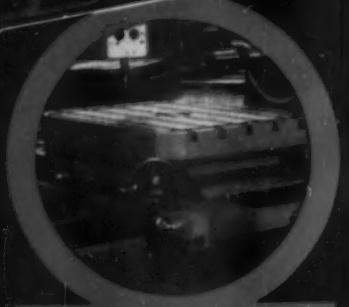
Infinitely variable drives provide smooth continuous speeds (9.6-1350 RPM) and feeds (.276"-27.6"/min.) over the entire range. Feeds and Rapid Traverse can be imparted to all movements of the headstock and table, including the rotary movement in either direction

The precision inherent in the design of the FBs can be utilized to the fullest extent with extra SCHARMANN features. The Optical Measuring Device, employing engraved glass scales, microscopes and dial indicators, is accurate to within .0005". Automatic Positioning for headstock vertical travel and table cross travel, allows positioning to within .0005", so necessary in coordinate boring work. For rapid mechanical setting, the Creep Feed, push button controlled from the pendant station, provides jogging in increments of less than .0004". The Automatic Tool Ejector provides for fast tool changeover without damage to spindle or tooling.

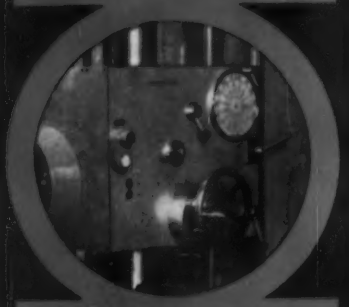
Enjoy the modern exclusive SCHARMANN design and construction features that provide precision, quality, and dependable production at lowest cost, year after year. SCHARMANN Service Representatives are located in principal cities everywhere. There is one near-by to assist you.

Visit us at Booth No. 1501 ASTE Industrial Exposition, Chicago, Illinois . . . March 19th through 23rd.

Write today for additional information.



Solid-block construction of table and saddle units with single handwheel for rapid locking, releasing, and pressure relieving of the table.



Simplified, conveniently located headstock controls, showing microscope and dial indicator of optical measuring system, and direct reading speed dial showing both RPM and commonly used cutting speeds in ft./min.

SCHARMANN *Machine Corporation . . .*

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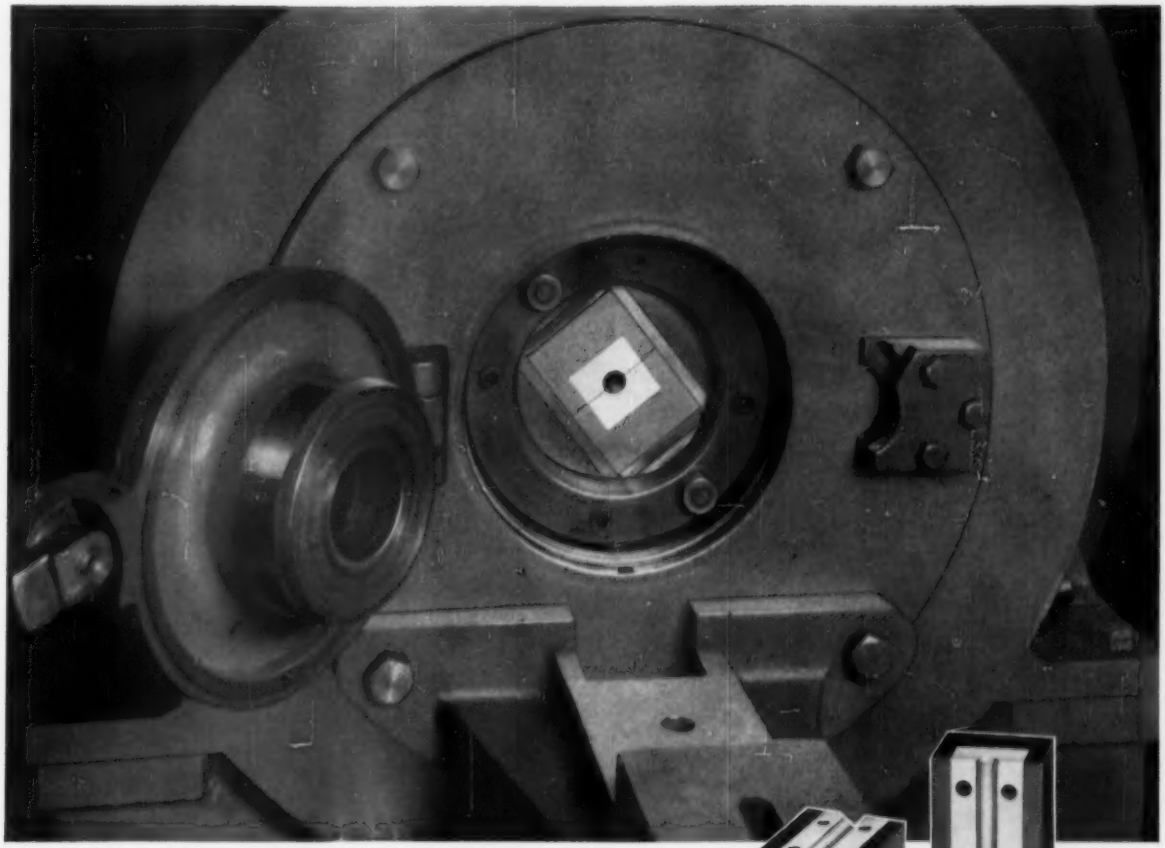
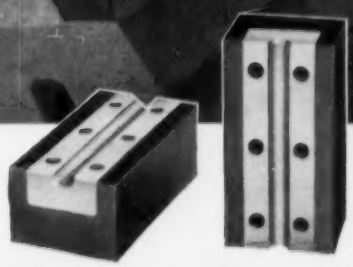
Table Types • Floor Types
Portable Types

HORIZONTAL BORING MACHINES





You get best results with KENNAMETAL* Die Grades

Kennametal's "90 Series" with six grades and the exclusive non-galling "80 Series" with three grades provide a range to meet the specific requirements of any die application. Hence, die parts of Kennametal sustain high production rates, maintain accuracy over extremely long production runs with a minimum of maintenance, and decrease operating costs.

Choose Kennametal for your next die parts . . . for blanking, stamping, compacting, perforating, slitting, piercing, cold heading, swaging, forming, cupping, drawing. Kennametal die engineers will gladly work with you in applying the right grade. Call your nearest Kennametal office or write to KENNAMETAL INC., Latrobe, Pennsylvania. Ask for Booklet B-100.

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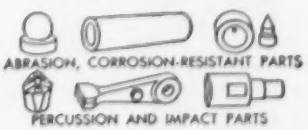
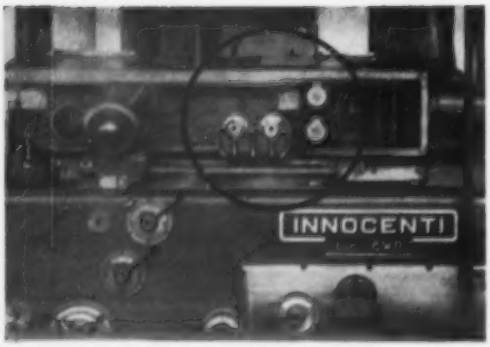
Grade K90 saves $1,575.00 in die costs in 18 months Because of its high resistance to deformation, crushing and edge wear, Kennametal Grade K90, used in the dies shown above for copper tube sizing and straightening, has reduced monthly die cost to only $35.00, as against $122.50 for previous hardened tool steel dies. In 18 months of operation, the saving totals over $1,575.00; and the Kennametal dies are still in operation.

Grade K84 sizes 142,200 tubes against 60,000 . . . with less wear

The effectiveness of the tungsten-titanium K80 Series is demonstrated by a set of eight Kennametal Grade K84 tube sizing rings used to size the I. D. of 5" rocket tubes. With only .010" reduction in ring diameter, non-galling Grade K84 has sized 142,200 tubes, while in comparison another carbide showed .013" wear after sizing only 60,000.

INDUSTRY AND KENNAMETAL ...Partners in Progress





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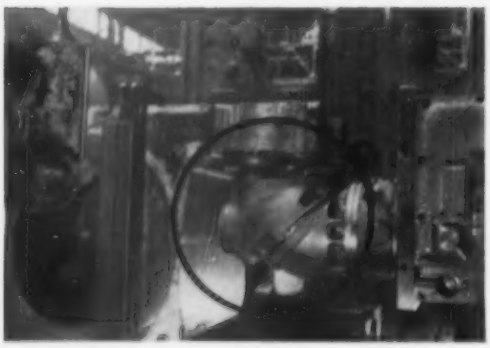

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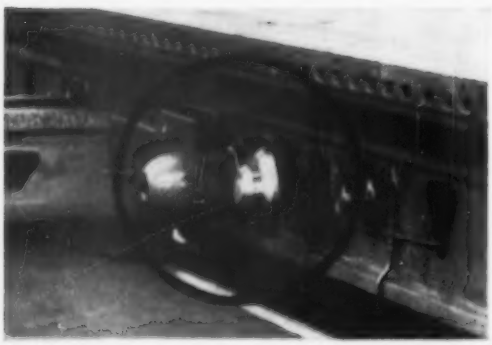

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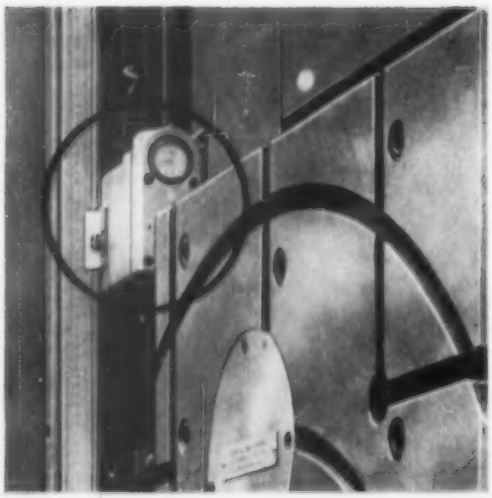

4

5

48

for instance

1. Patented suspension of the spindle carrying headstock, allowing automatic adjustable compensation of the deflection of spindle axis during feeding, according to the importance of the machining heads utillzed.

2. Front face of the machined headstock, provided with slots - patented design - for fixing various milling heads (right angle heads, or any other angle) allowing surfacing operations through feeding movement of the headstock.

3. Patented motors with stepless range of speed, allowing the exact choice of cutting speed and feed for a determined machining operation, as well as a constant maximum operating efficiency.

4. Patented automatic cycles for high precision positioning of feeding movements.

5. Patented pendant control box allowing selection of speeds and feeds at any working position of the operator (this position being adjustable at 340° rotation over an operating range of 12 feet or more round the machine, at any height.
Start, stop, feed reverse, deceleration and selection of spindle speeds.
Start, stop, feed reverse, acceleration, deceleration and selection of spindle feeds, separate or simultaneous on two feeding movements.
Locking of all movements after selection and adjustment.
Adjustment and spindle positioning.
General stop button.

PATENTS

all over the world protect this machine

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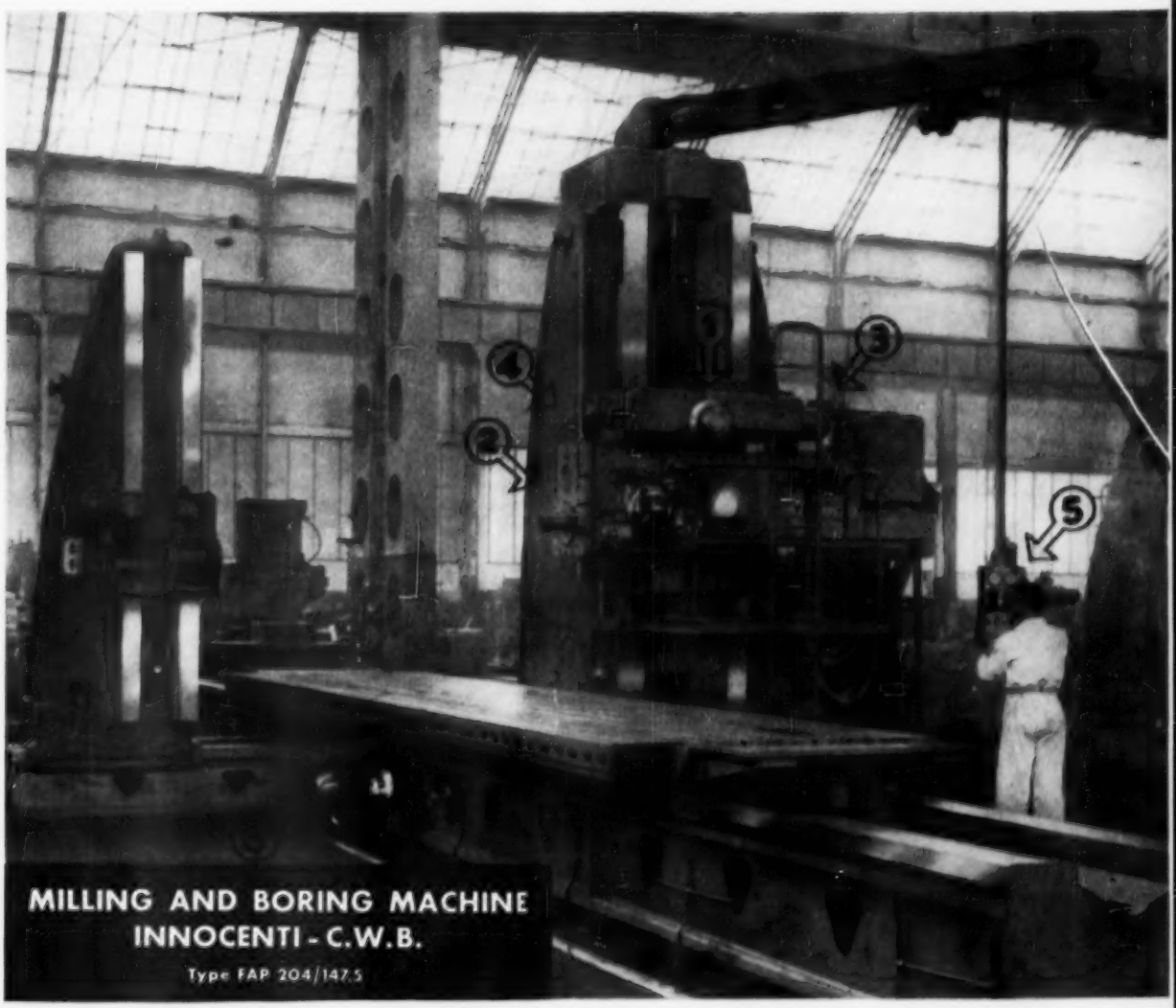

MILLING AND BORING MACHINE
INNOCENTI - C.W.B.
Type FAP 204/147.5

the design of this machine and its versatility are such that a saving of 50% to 80% in the machining times can usually be made over conventional machines.

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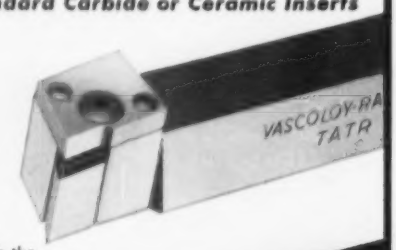
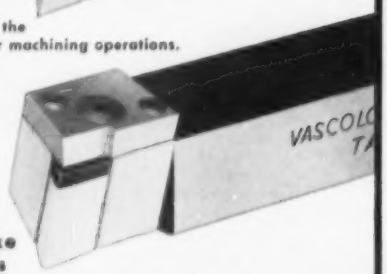
Savings Range from 10% to 200%!

The Finest Toolholders You Can Buy for any Standard Carbide or Ceramic Inserts



Negative Rake
styles to handle the majority of your machining operations.



New 6° Positive Rake Toolholders
offer big savings on jobs requiring positive rake tools, such as straight or 15° lead angle turning and facing as well as plunge turning of aluminum, soft brass, copper, bronze, stainless steel and alloyed steels.

Only one adjustable part—
V-R's exclusive elevator!

No Grinding when you use V-R toolholders and throw-away inserts!

Less Downtime because you do not have to reposition the toolholder when you change or index inserts!

Less Carbide Inventory because you get six or eight cutting edges per insert at pennies per edge!

Lower Carbide Cost because you eliminate carbide waste. You can consume up to 90% of a long insert with a V-R toolholder, nearly twice as much as with any other!

Faster Tool Changes because one main screw controls clamping of the insert—nothing to fall out or require readjustment!

Lower Chipbreaker Cost because V-R chipbreakers are ground to the width you specify at no extra cost!

ASK FOR NEW TOOLHOLDER CATALOG
24 pages of data on V-R negative and positive rake toolholders and V-R carbide inserts—triangular, square, round and diamond; throw-away and 1½" lengths. Call your local V-R Representative or Distributor, or write Vascoloy-Ramet today.

Styles to handle 90% of Your Machining Operations

Standard Brazed Tool — **Comparable Toolholder**

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Straight Turning

Standard Brazed Tool — **Comparable Toolholder**

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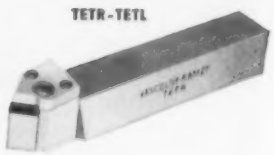
TETR-TETL



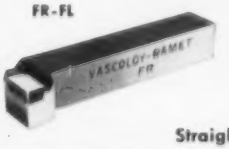
45° Lead Angle Turning

BR-BL

TBPR-TBPL

15° Lead Angle Turning

FR-FL



TFPR-TFPL

Straight Facing

E

TDTR-TDTL

30° Lead Angle Turning

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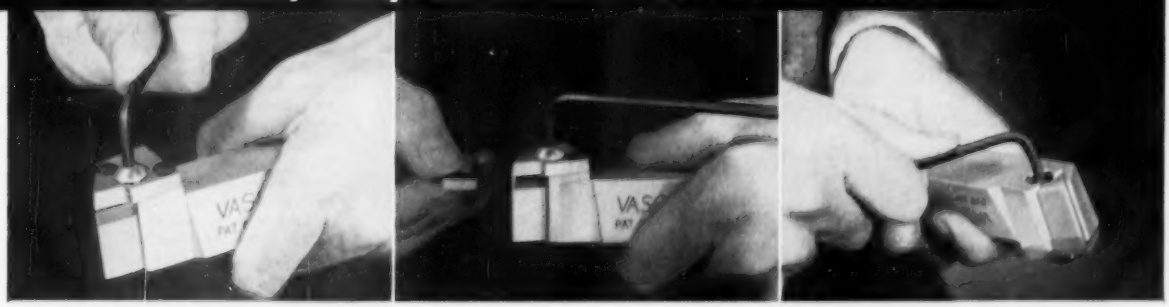

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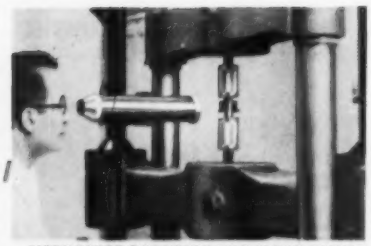

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- **BULLETIN NO. 26**
- **BULLETIN NO. 27**

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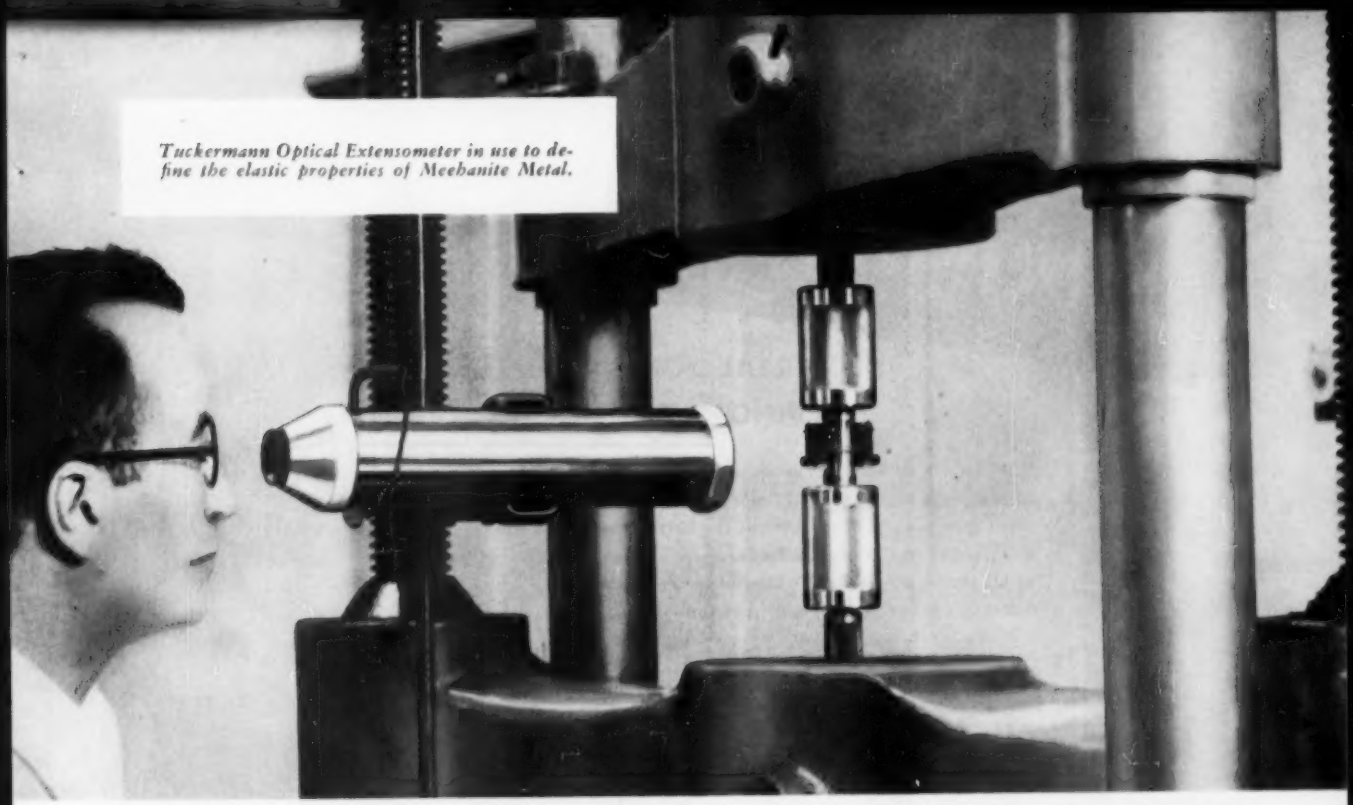
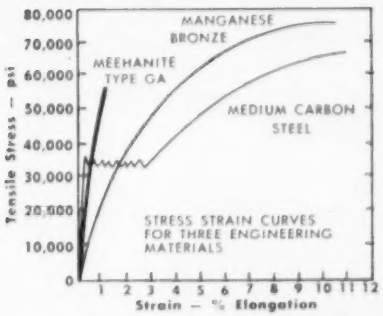


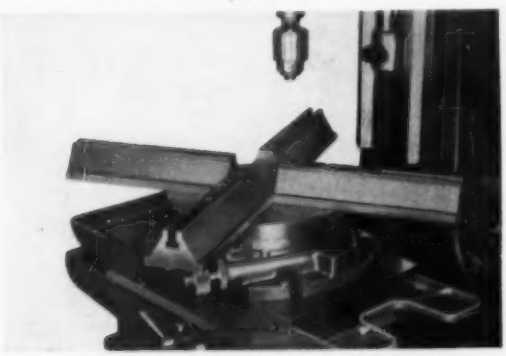
Tuckermann Optical Extensometer in use to define the elastic properties of Meehanite Metal.

MEEHANITE METAL PROVIDES DEFINED ELASTIC MODULUS VALUES FOR THE DESIGN ENGINEER

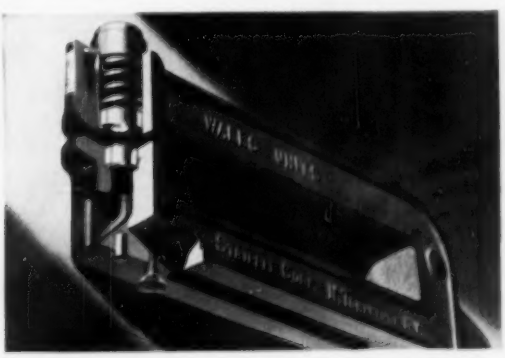


Meehanite Castings have true elastic property characteristics. Results of test data obtained from the use of sensitive strain gages have established modulus values ranging from 22,000,000 to 17,000,000 psi according to the type of Meehanite Metal. Modulus of elasticity for Type GM is 22,000,000 psi; Type GA 20,000,000 psi; Type GB 18,000,000 psi; Type GC 17,000,000 psi.

The data also demonstrates that true elasticity persists up to loads approximating one-third of the tensile strength of the metal. Design with confidence. Specify Meehanite Metal for your casting requirements. For additional information, write for Meehanite Design Data, Bulletins No. 26 and No. 27 today.



High modulus with resistance to elastic deformation is important in these Meehanite extension parallels where maintenance of required dimensions is essential.



Dimensional stability and high resilience of Meehanite Castings is typified in this Wales Hole Punching unit. The superior stiffness of Meehanite Metal permitted units to be made with 8", 12" and even 16" throats.

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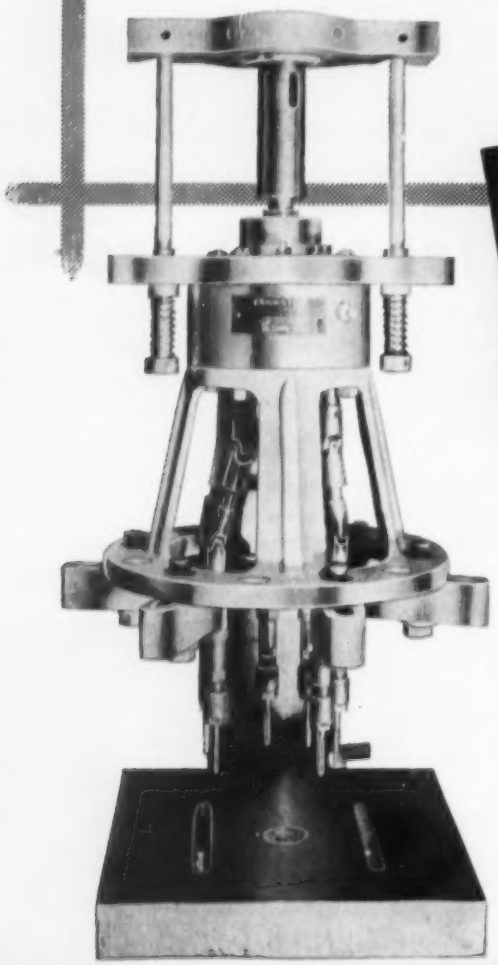

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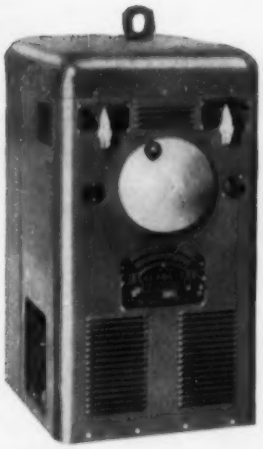

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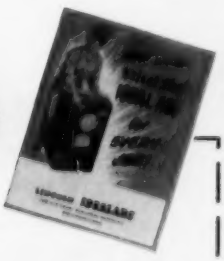

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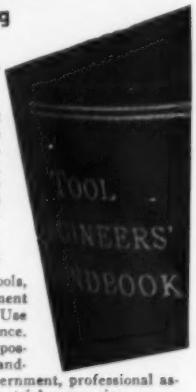

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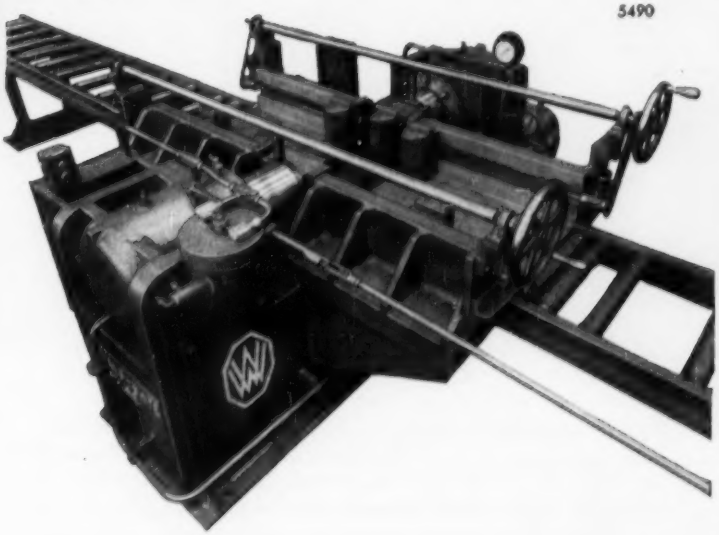

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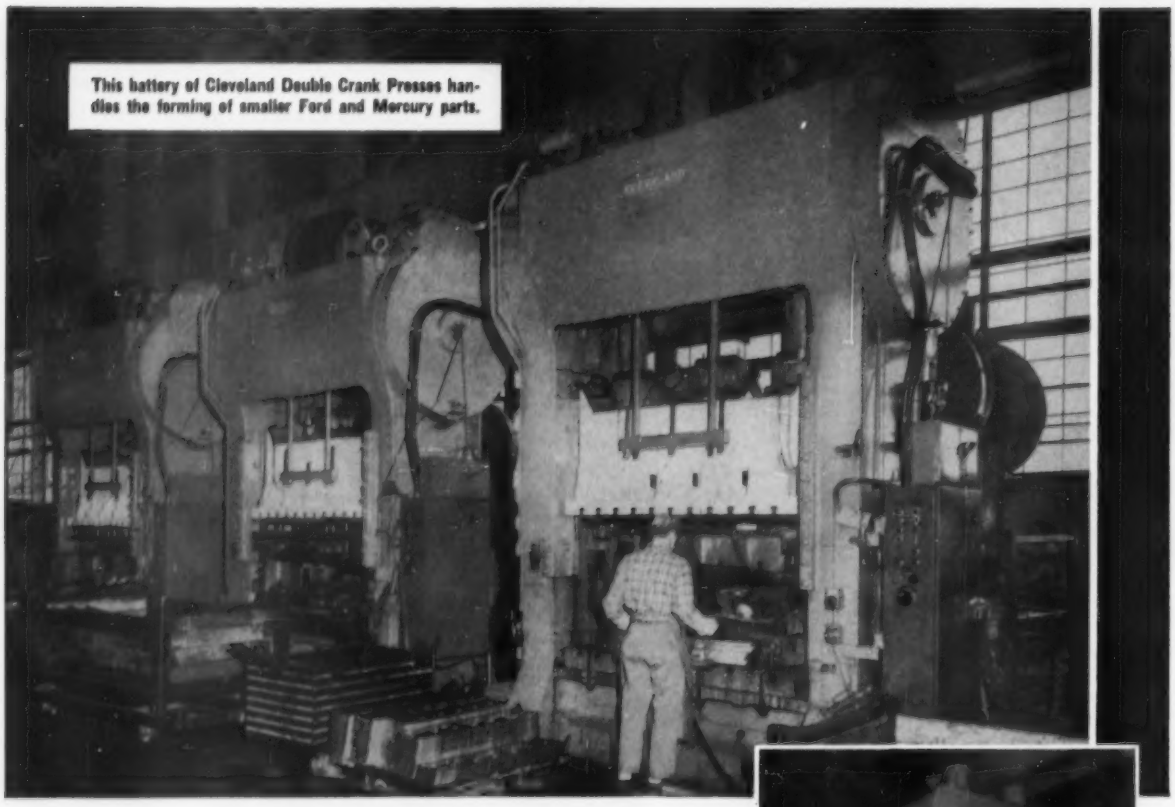

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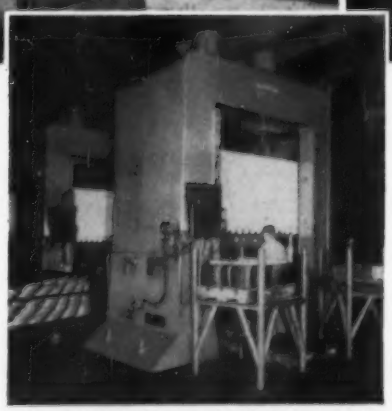

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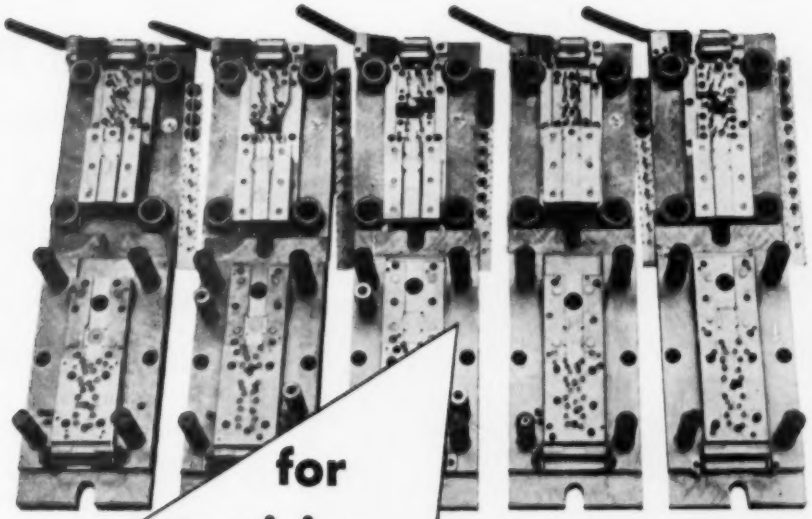

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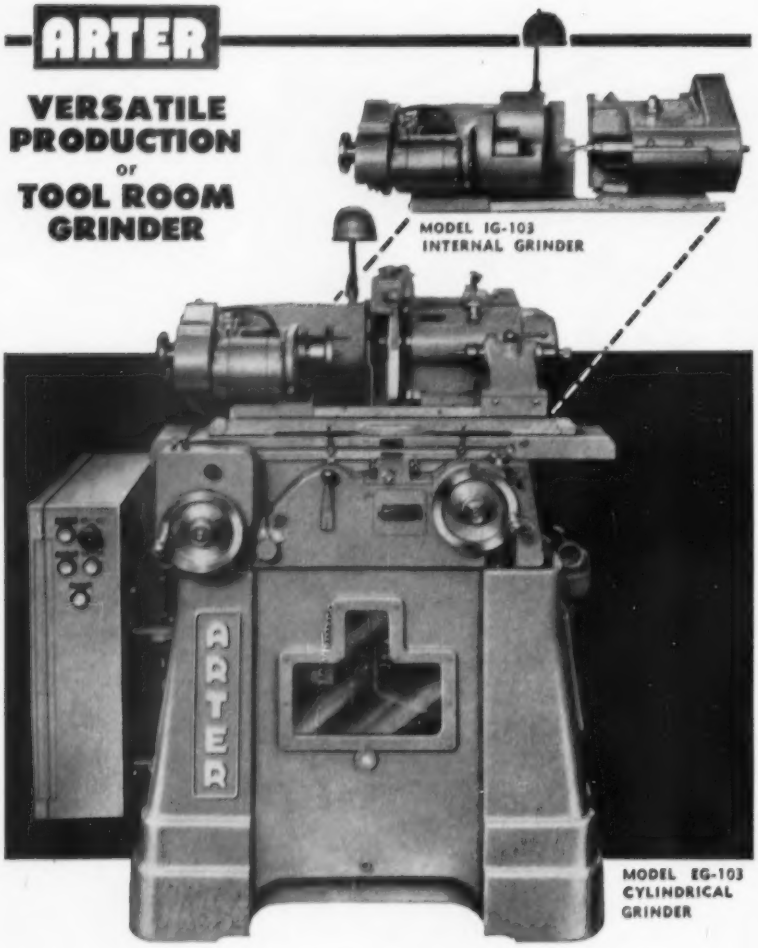

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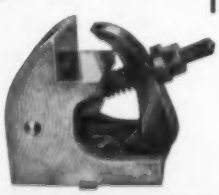

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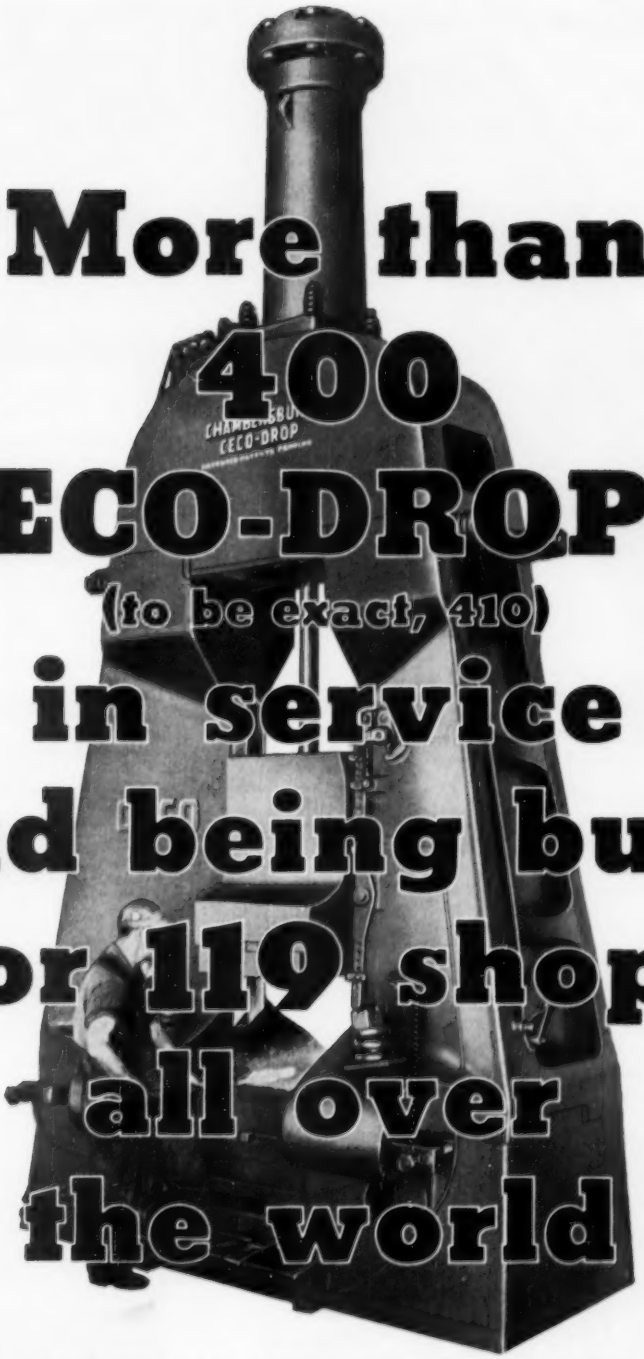

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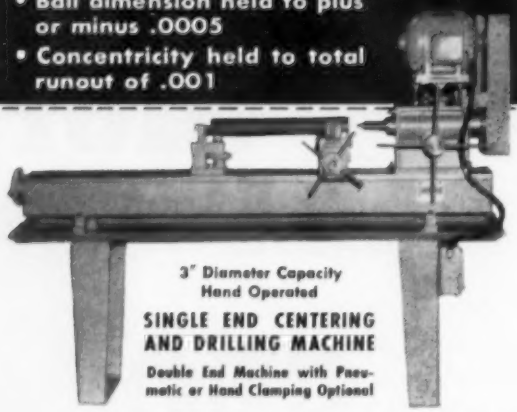

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Double End Machine with Pneumatic or Hand Clamping Optional

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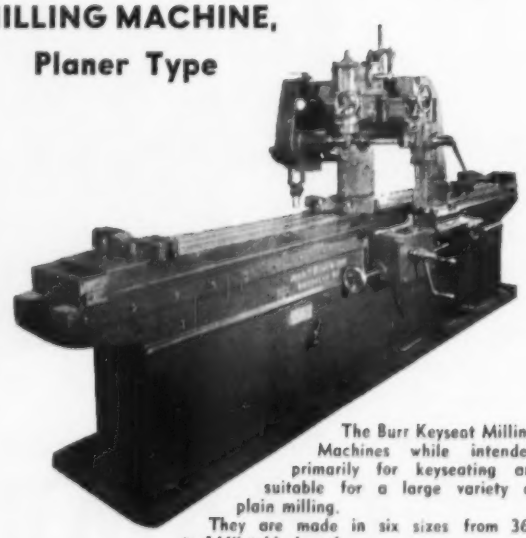
MILLING MACHINE, Planer Type



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They are made in six sizes from 36" to 144" table length.

This is a sturdy heavy duty machine equipped with a vertical head. Also Burr Portable Shaft Keyseaters in five sizes for hand, drill and motor operation. *Write for details.*

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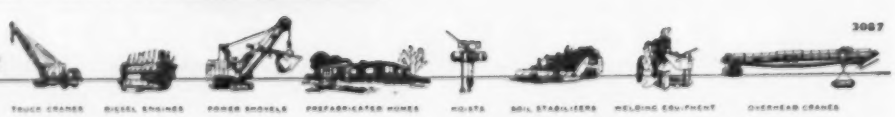

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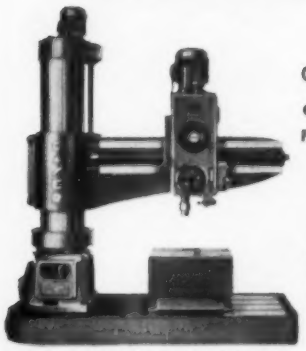

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MODEL FR-10/1250
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FEATURES:

Single push button clamping of column and head • Single control for power arm elevation • Single control starts, stops and reverses spindle with pre-selection of all speeds while machine is running • Speed dial permits speed and feed selection while machine operates • Single knob feed dial can be operated while machine is running and feed is engaged

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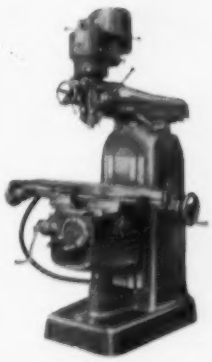

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The Westbury 1-S and 1-R

Hardened and ground high-speed ball bearing spindle — 5" quill travel, micrometer depth stop — Three feeds, .0016; .003; .005 — Rapid spindle change over, 8 speeds (80-2713) — Dovetailed overarm (1-S) — Round over-arm, (1-R) — Precision angle setting control — Rigidly mounted table — 42¾" x 9 1/16" — 30" longitudinal range, 10" transverse, 16" vertical — Positive locks — Motor, 1.5 hp — Weight, 2200 lbs. The Duplomatic Duplicating Attachment Mod. FR for Milling Machines: Hydraulic precision reproduction of molds, patterns, and templates, in any material.

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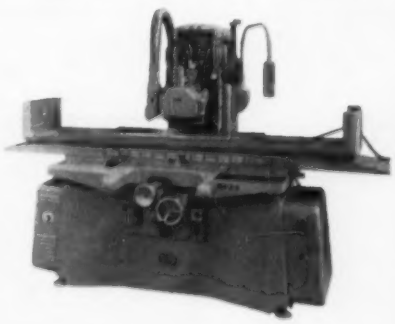

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The Westbury 1-U, 2-U, and 3-U;

Heat-treated, hardened spindle; all moving parts designed to withstand overloads in excess of 100% — Spindle mounted on adjustable tapered roller bearings — 12 speeds, 28 to 1100 rpm or 35 to 1600 rpm — dial and hand control for selecting and reversing — Splash lubricated spindle gear box, extra gear pump for added safety — Power feed and rapid traverse in all directions — Climb milling — Special safety devices prevent operating errors — All ways handscraped — Single lever engages rapid traverse to all movements.

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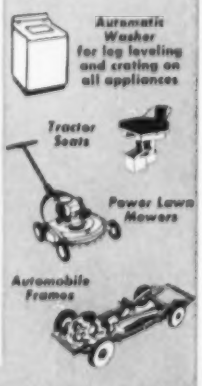

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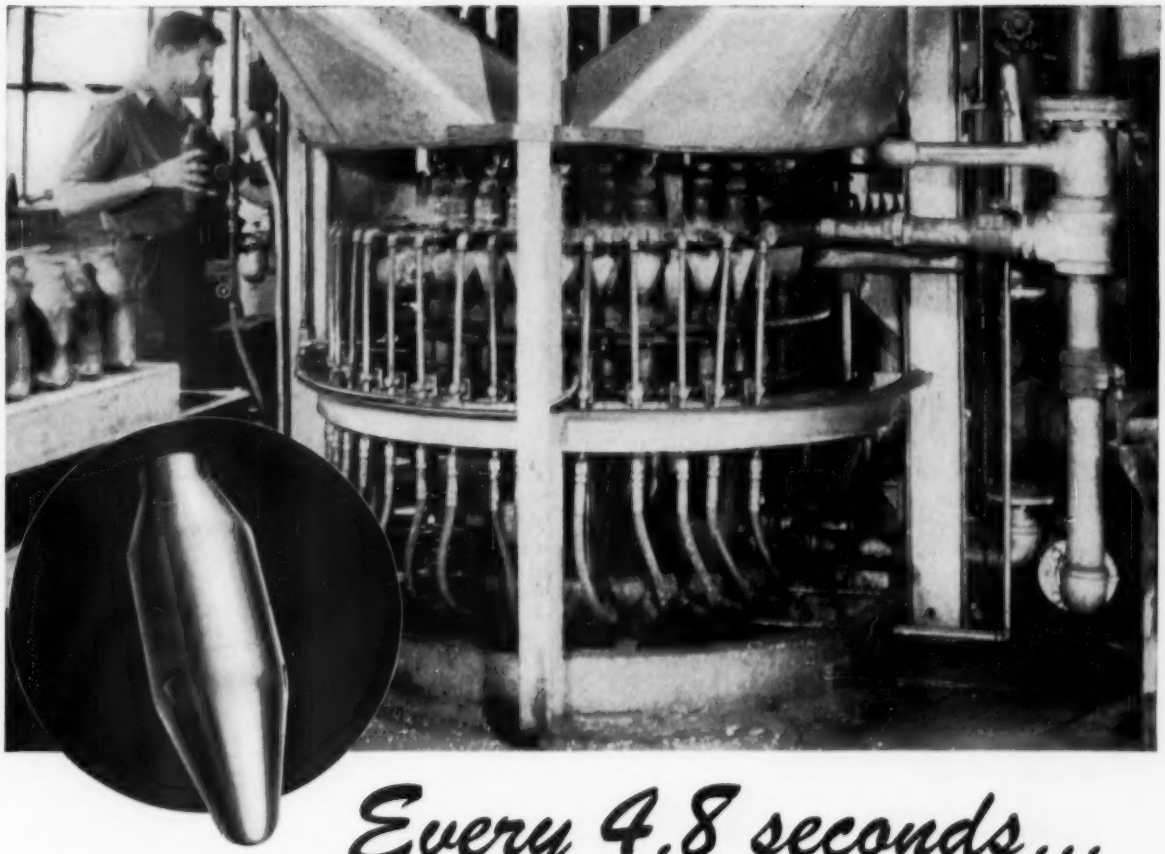

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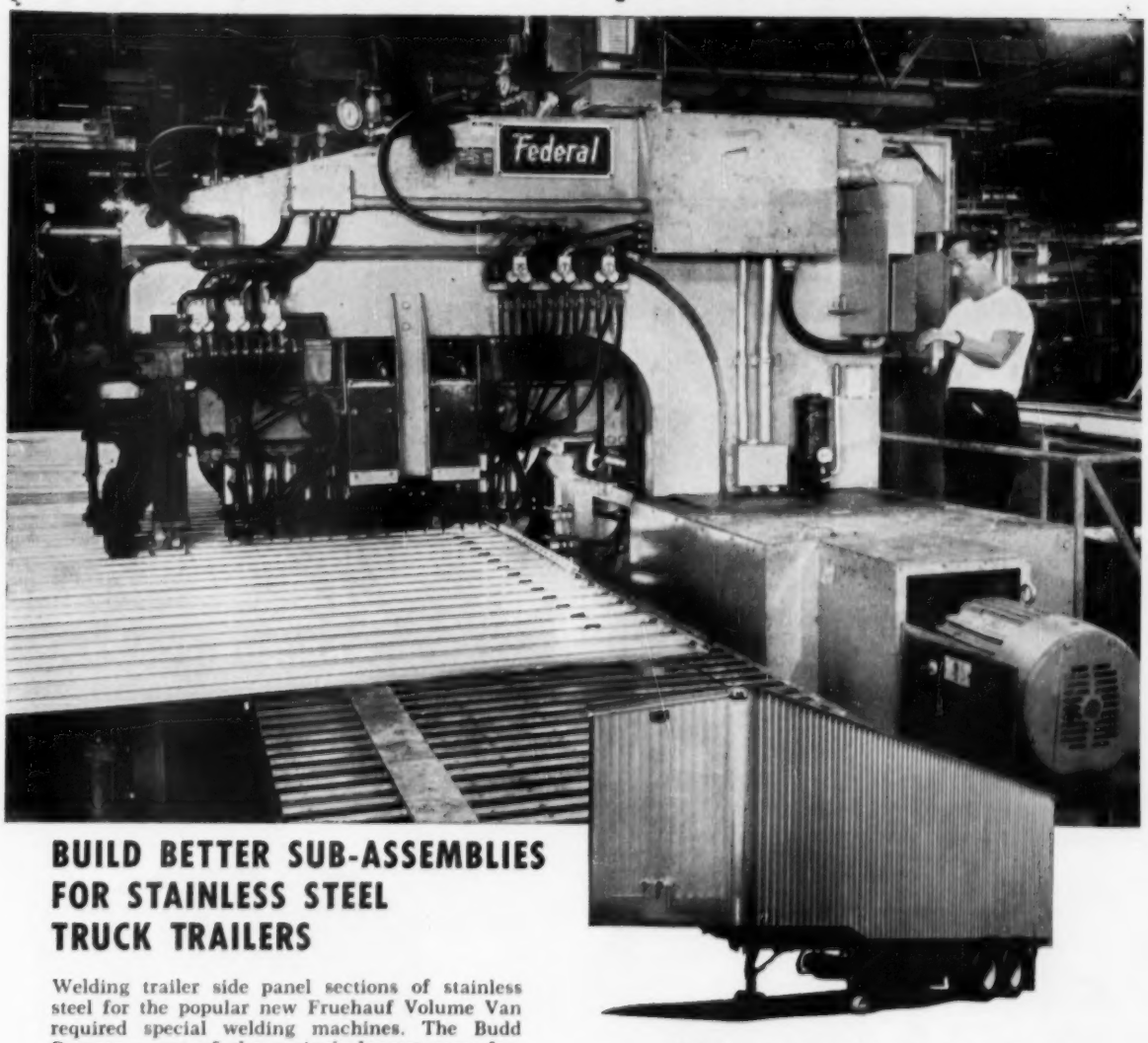

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WELDING SHOW

Booth No. 73

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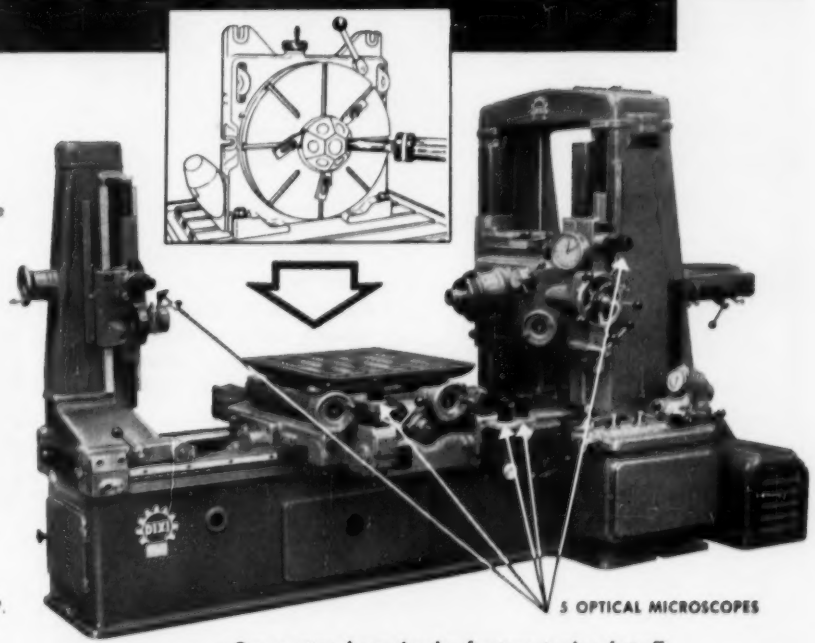

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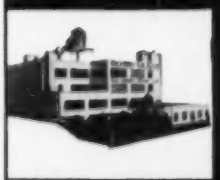

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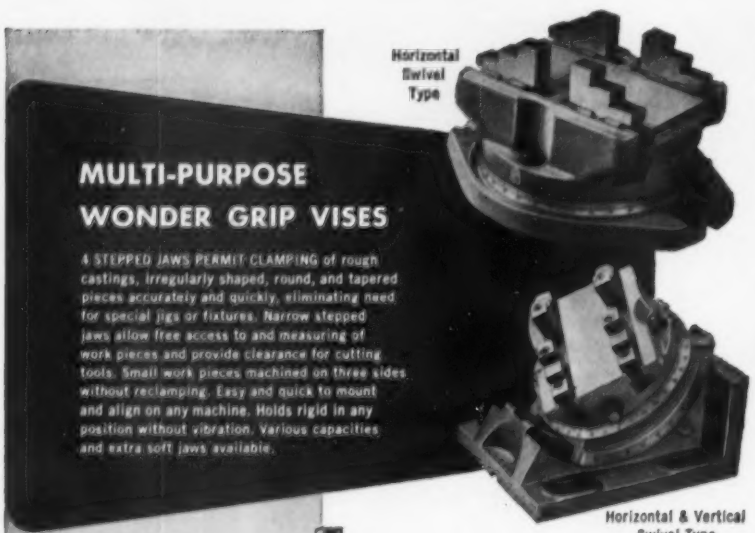

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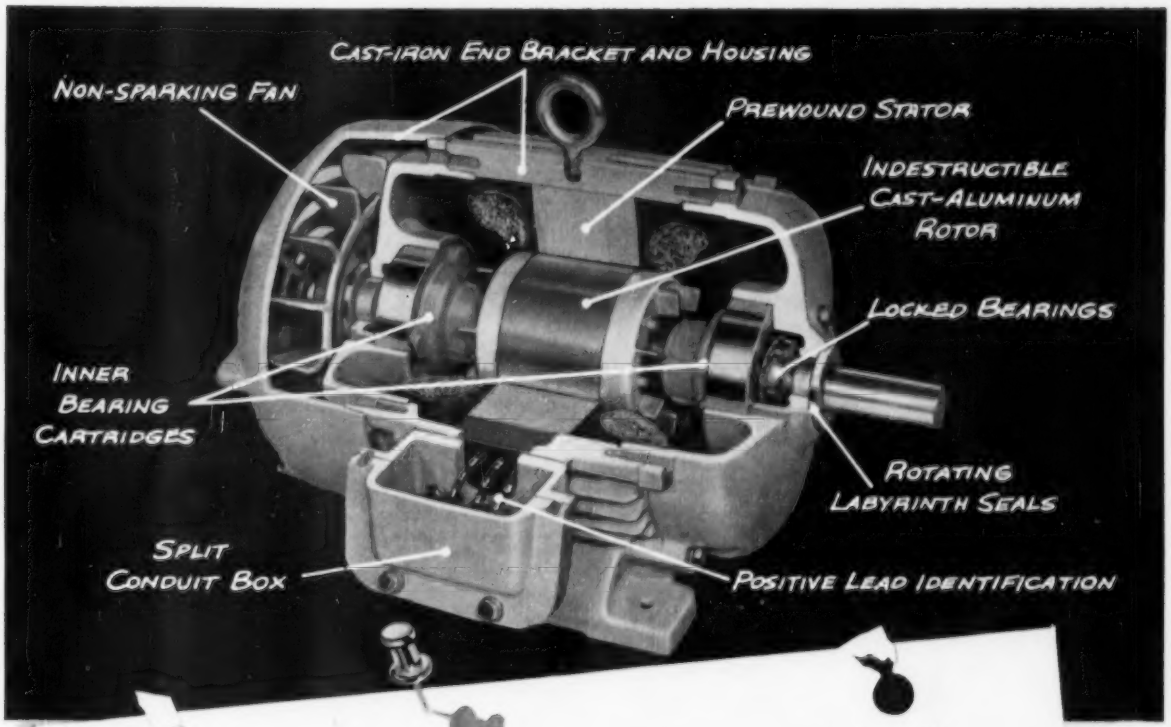
From the *American Machinist* Library of *Tips for Top Shop Men*

SOME wag said long ago that it isn't smart to step on other men's hands as you go up the ladder—you may need their help coming down. It's just as true that the man who makes his way up by slipping a knife in the back of the man above, spends his time up there ineffectually because he's always got one eye cocked over his shoulder, watching for the knife.



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Louis Allis gives them to you in the new L. A. enclosed and explosion-proof motors

For years, Louis Allis has specialized in special motors for many of industry's toughest drive problems. Such installations call for extreme care in both motor design and manufacture—care that has become a habit with us. We build our enclosed and explosion-proof motors with the same special care.

What does this mean to you? It means that you get a motor with extra features—a motor that runs better, lasts longer. Here are a few of the extra reasons why:

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- New, exclusive phenolic impregnating varnish provides high thermal and chemical resistance. It remains resilient and resists aging, prolonging the life of the motor.
- Inner bearing cartridges lock bearings to end bracket and form explosion-quenching seal along the shaft. Inner race of bearing locked to shaft, reducing end play—an extra quality feature.
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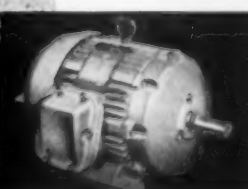
There are many other features such as a new diagonally split conduit box, sturdy cast-iron construction, positive lead identification, non-sparking fan. Our new bulletin No. 1700 shows why you get extra value for your dollar in a Louis Allis explosion-proof motor. Write for your copy.



New LA line explosion-proof motors are available in rerated frame sizes 182 through 326U, and in ratings of 1 to 30 hp, 3 phase, and 1 to 5 hp, single phase. Also available with Underwriters' approval for Class I, Group C hazardous locations.

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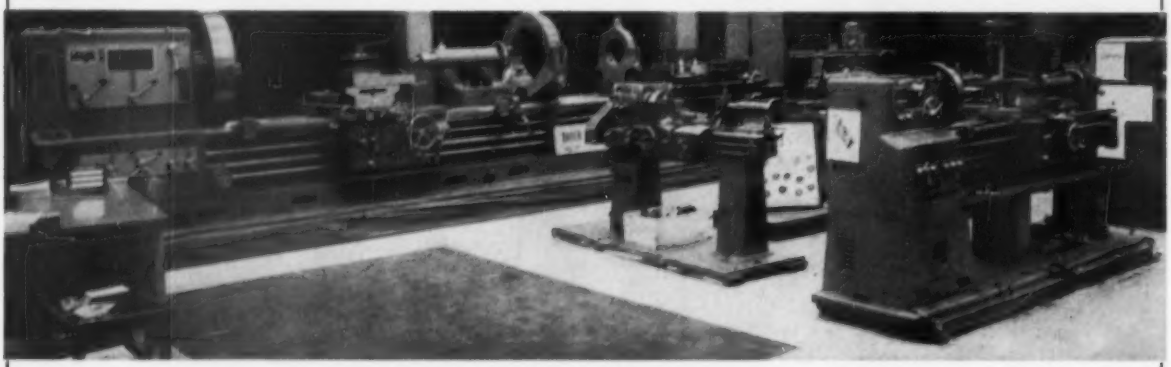

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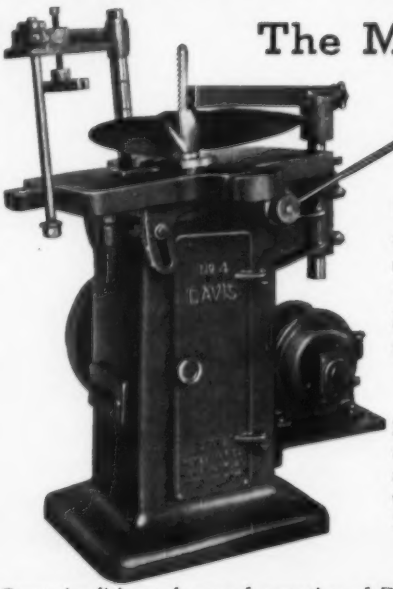

Illustration shows typical set-up for cutting taper keyways with table tilted.

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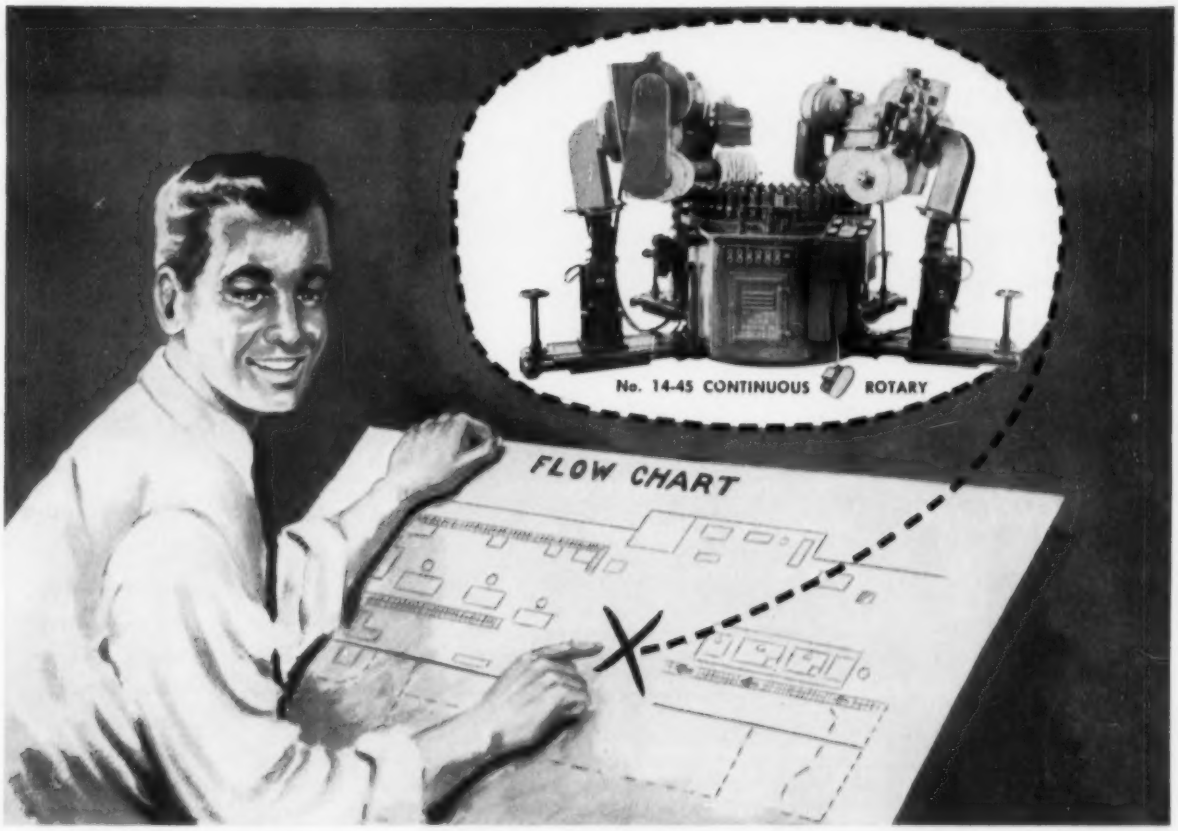

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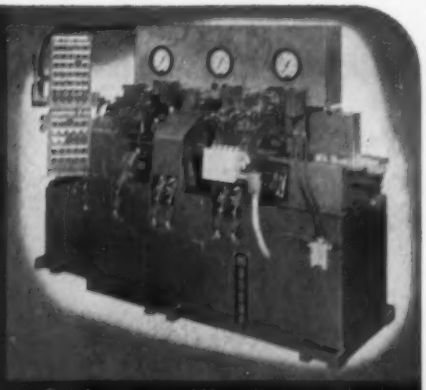
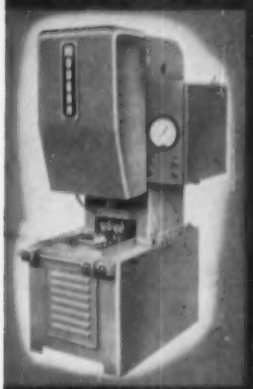


Transfer unit checks 133 manifolds per hour



Model MPT-1 unit for transmission converter housings

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From the *American Machinist* Library of *Tips for Top Shop Men*

DO you know just what you have in material and equipment inventories? If you don't, you'll drop more dollars than you think. It isn't necessary to know how many peanuts there are in the barrel (as one store clerk attempted to discover) but you must know how many barrels, and how rapidly one is used up.

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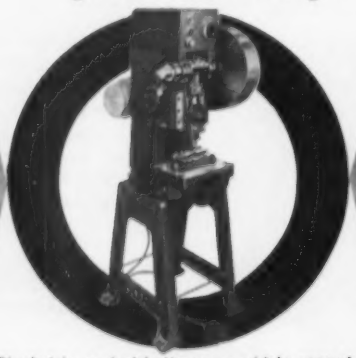

Single-trip control buttons are widely spaced, to keep hands clear of the danger zone. Operator must push both buttons at once . . . hold them until stroke reaches bottom, then release both buttons to start new cycle. Fail-safe operation. Impossible to "fudge." Impossible for press to double trip.

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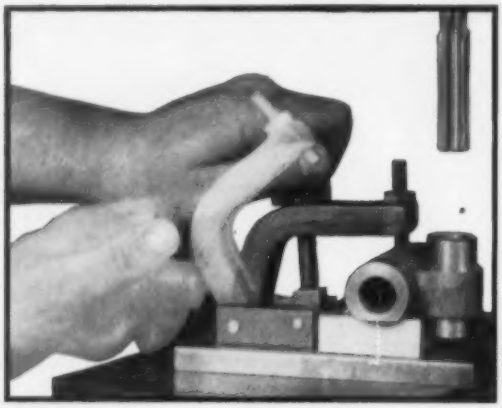
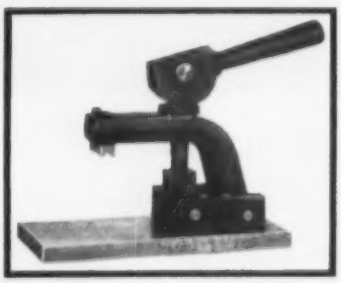
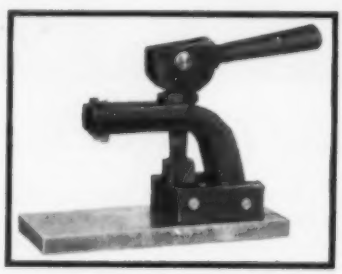


As quick as your hand, a quarter turn of the screw—one movement of your arm—and your Lodding Clamp is at work. Another simple movement releases work and retracts Clamp. Here is complete surety and quick action—a time and cost saver. Four sizes each of four styles. Hand knob, cam or nut.



Block Adaptor



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Originally, this seventh Inventory was a feature of the 1954 Production PLANBOOK issue of *American Machinist*, so you may already have its 96 fact-crammed pages on your library shelves. But if you need extra copies of this invaluable obsolescence report, you'll be glad to know that a limited supply of reprints still is available. Copies are $2.00 each. To get yours promptly, write or call . . .

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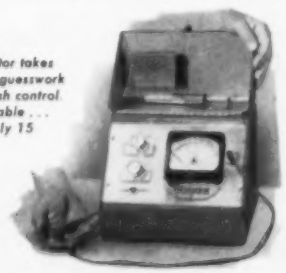
When does surface smoothness begin to waste your money?

In most plants today when a design engineer specifies a certain finish for a part, no one in production knows whether the part will be overmachined, O. K., or too rough until that part reaches the inspection department.

By then it is too late.

The costly consequence is that the company loses money on every part finished too well, AND on every reject resulting from underfinishing. Surface finish begins to waste your money at two precise points . . . *the moment you finish a part a single microinch better than the job requires, and the moment you finish a part a single microinch worse than required.*

Surprising as it may seem, most in-process checking today consists of judging how the finish *looks* and how it *feels* because no accurate, portable, in-process checking equipment has been available. The production department had no tool that could instantly tell the machine operator when he had met the specification.



The Brush Surfindicator takes the costly guesswork out of finish control. Fully portable . . . weighs only 15 pounds.

What has been done?

Brush has developed an amazingly rugged electronic surface measuring device called the SURFINDICATOR* which can be carried anywhere in the shop to obtain an instantaneous, accurate in-process measurement of roughness on any surface – flat, round or inside-a-hole.

Now you can set up optimum specifications for surface finish based on your laboratory or pilot model tests . . . and then hand a reliable instrument to the production department to help them meet those specifications with no waste of worker or machine time. You can mount SURFINDICATORS at each machine or set up checking stations throughout the plant. And your regular machine operators can use them . . . it doesn't take an expert.

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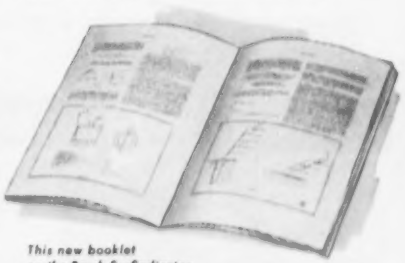
All the user does is pass the stylus over the surface in question and take a direct reading. It's simple, fast, accurate and above all it's practical . . . for metallic surfaces and for glass, porcelain, plastic, paper and other materials.



This new booklet on the Brush Surfindicator includes the new ASA standards . . . will help you establish economical surface finish control.

You should know all about this portable device, its many, many uses and the savings it can mean to your company. We tell the whole story in a new booklet which also includes the new ASA standards on surface finish for industrial use. Write for your copy today on your company letterhead. *T.M.

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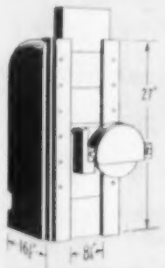
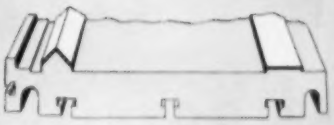


RIGID VERTICAL SLIDE

Grinding wheel and head are supported by the rigid vertical slide which is 16½" in depth. Length of vertical ways is 27". Distance between vertical ways is 8¼".

CONVENIENT CONTROLS

Elevating hand wheel with floating vernier dial pointer is handily located below table level where it doesn't interfere with operator's access to the work. Power cross feed engaged by control on front of cross feed hand wheel.



HARD CHROME TABLE WAYS

Hard chrome plating preserves the original built-in accuracy. Chrome is applied direct to alloy cast iron surface of V and flat table ways after they are precision hand-scraped.

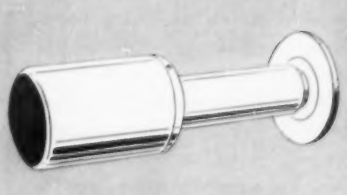
COVEL No. 10

HAND OR POWER FEED

SURFACE GRINDER

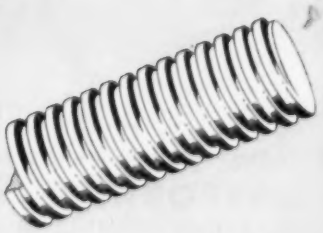
6" x 18" x 15"

Engineered to give you the most accurate gage, form tool and surface grinding performance for a low initial cost.



CHOICE OF SPINDLES

Covel offers your choice of Pope, Excello or Whitnon direct motor driven 1 H.P. 3450 RPM spindles. 3" diameter cartridge type. Spindle quill is supported to within 1¾" of its front end.



HARDENED AND GROUND LEAD SCREWS

Made of best quality tool steel, Covel cross feed and elevating screws are hardened and ground to insure long-lived precision operation.

SMOOTH TIMING-BELT DRIVE

Eliminates grind marks often caused by gear drives. Non-stretch positive-grip toothed belt. No lubrication needed.

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UNIVERSAL CUTTER & TOOL GRINDERS • DRILL GRINDERS

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BENTON HARBOR, MICHIGAN
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NEW L&J NO. 7 PRESS

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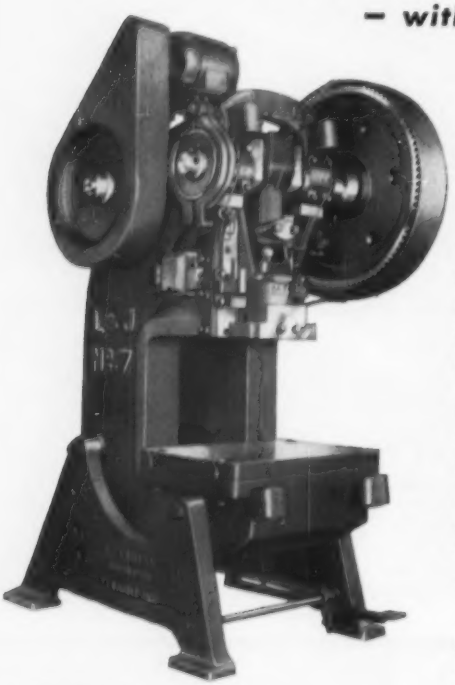

This new press will give you greater production at lower cost. Its alloy iron frame has exceptional rigidity which holds deflection to a minimum and gives closer tolerances, greater uniformity and longer die life. Accuracy is also obtained through adjustable gibs of extra length. The rugged ram adjusting screw has buttress threads and replaceable hard bronze seat. Air clutch optional. Geared and non-geared models.

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* bed to ram, standard stroke down, adj. up.

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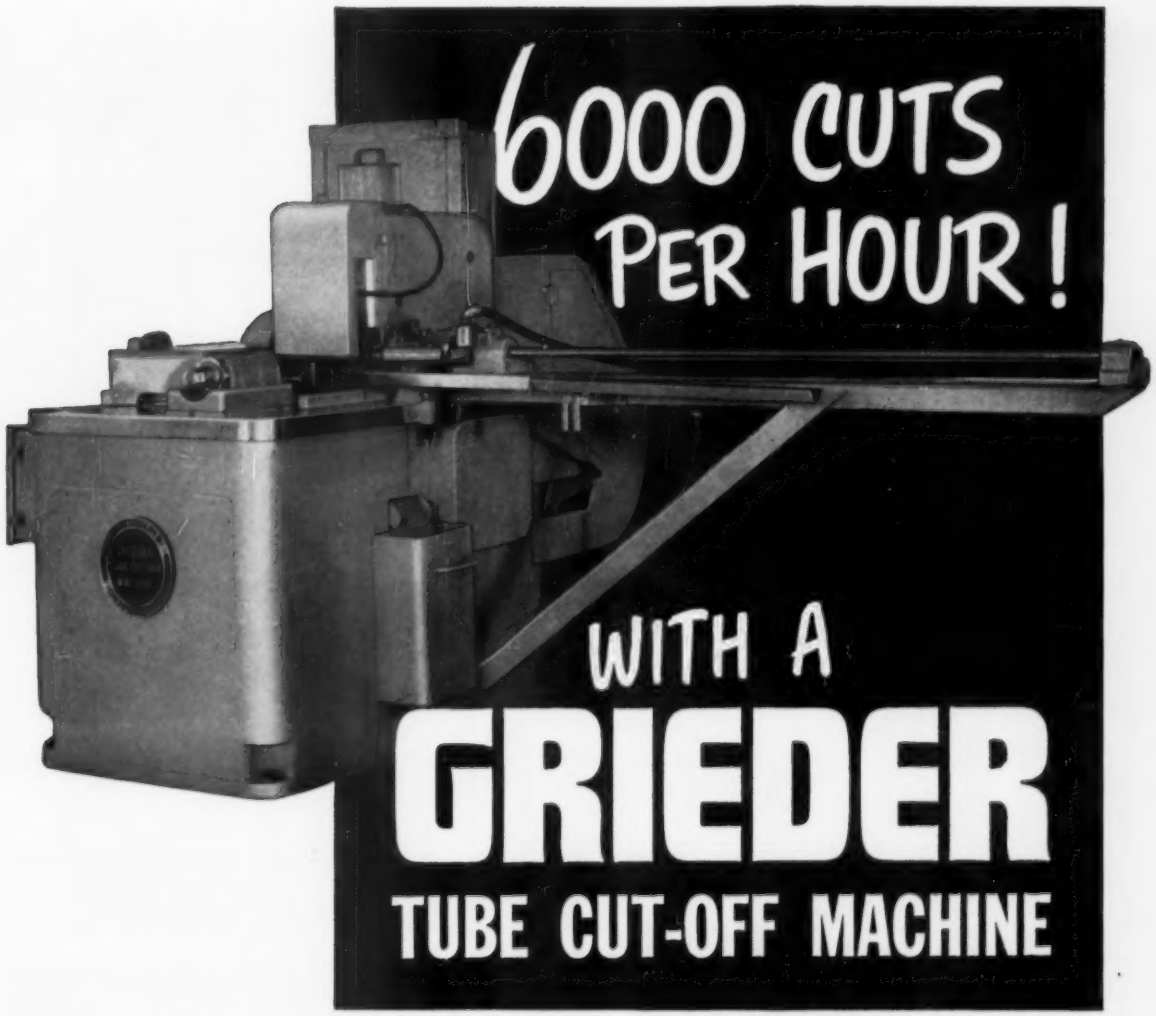

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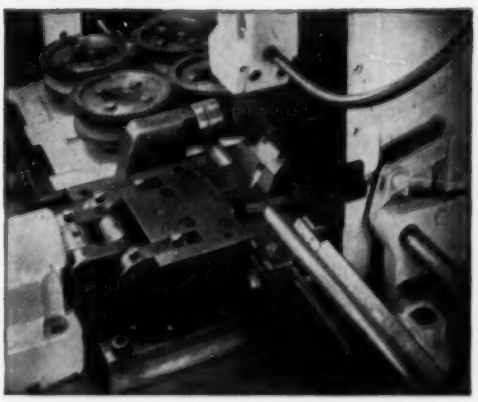

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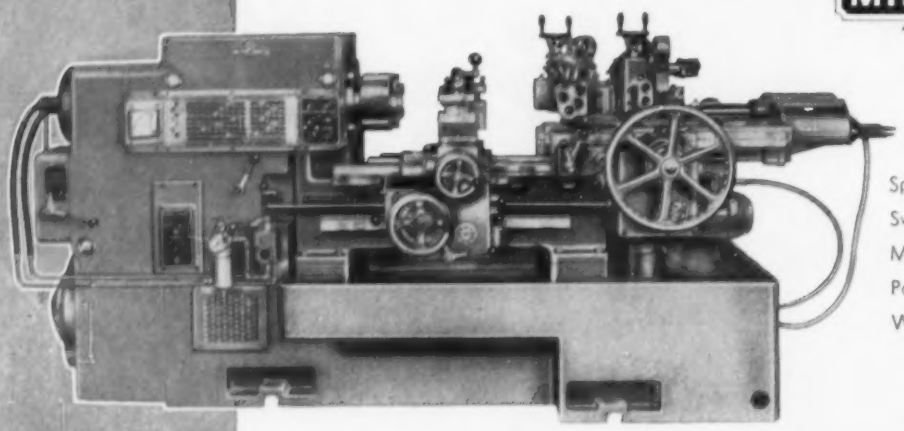

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Gaging . . .

the Surplus Machinery Market

Practically every metalworking shop, large and small, buys surplus production equipment from time to time. The surplus market thus is of keen interest to all machinery users. With this issue we begin publication of this column devoted to reporting conditions in the surplus machinery market. The contents are based on on-the-spot checks made by our correspondents from coast to coast.

Brisk demand for surplus machinery of postwar design is reported by dealers in metalworking centers coast to coast. Sales are closely paralleling the sharp upturn in new machine tools, which has resulted in lengthening delivery time on new equipment.

This has resulted in a current nationwide sellers' market in surplus machine tools of good quality. Another factor: shops are hanging on to their fairly modern machines for standby emergency use, even though they are buying up-to-the-minute replacements.

One disturbing note, as seen by a prominent Midwestern dealer, is that fast-rising price levels for surplus machinery may kill the goose that laid the golden egg. Too many dealers stayed out of the buyers' market a year ago when machines were plentiful, preferring to wait until they had resale orders in their pockets before buying a machine. Result is that a few months back they all turned up with a pocketful of orders at the same time. Up went prices.

This has been evident at recent machine-tool auctions, where buyers have paid higher prices than they would have paid for a reconditioned and guaranteed machine at a dealer's. This goes for standard surplus machines of prewar design and good quality only. Special machine tools are moving slowly, unless they can be converted to other purposes at a nominal cost.

MIDWEST: pickup in sales over the last six months has been remarkable, is expected to hold up well throughout the year. Demand in Ohio metalworking centers is for standard toolroom and production machines, particularly horizontal boring machines. Chicago market is firm for postwar machines, but dealers are having trouble in getting machines for resale, and showroom stocks are low. Here, too, standard production and toolroom machines of postwar design are moving well. Detroit dealers report action has picked up considerably in the last month or so, and that a historical beginning-of-the-year business decline was cut short in mid-January by a flood of new orders.

WEST: business is spotty, with Los Angeles surplus machine sales booming, and San Francisco and northern Pacific Coast business slowed almost to a standstill in many areas. Los Angeles reports an influx of small shops to feed the aircraft and electronics industries. They're all starting out on a shoestring, can't afford new machines. Aircraft companies, loaded with new contracts, are buying surplus machines to step up production pending delivery of long-lead-time equipment. Selling well in the LA area are all types of lathes and milling machines, grinders and some large shears and brakes. To the north, dealers say businessmen aren't making decisions about moving or expanding plants, making it hard to get surplus machinery, and hard to sell it when they do find it.

EAST: surplus-machinery market has been active in the last six weeks. Postwar models of standard machine tools are most in demand. Used machinery is becomingly increasingly hard to locate for resale, and owners want more for their machines. Reason: prices of new machine tools have gone up, so they figure resale value is up, too.

SEARCHLIGHT SECTION

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100" Betts V.B.M. 2 Swivel Heads
8 SP12" Type D Bullard Multaumatic, '41
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16"x72" Cinc. Cyl. Grinder 1942
16"x36" Norton Pl. Cyl. Grinder 1942
25-60 Cinn. Simp. Prod. Mill 1944
1404 K & T Prod. Mill 1943
36"x8' Betts Geared Head 1942
42"x18'6" Niles Engine Lathe 1942
36" Bullard Spiral Drive
54" Bullard VTL 1942
Somers and Adams Thread Mill 18" H.I.S. 1943
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3" Bar Universal Tble. Type, Triway
GRINDERS, 12"x48" & 16"x96" Landis, Late (2)
60" Hanesbit Vert. Spin., No. 300 Hyd., Surf.
Nos. 2B Reid, 5B Abrasive, Surf.
36"x42" Pratt & Whitney Die & Surf.
30"x120" Hanchett Plano, Surf.
16"x96" Cinci. Plain Cyl.
LATHES, 28"x192" Con. L. & S., T.A., Late
14"-16½"x78" Con. Monarch, T.A.
20"x54" con. Reed Prentice '43
TURRET, No. 2H10 Libby 10½", '45
MILLER, 2681J Van Norman '43
SHAPER—32" Cinci., '41; 24" Cinci. Univ., '48
SHAPER, VERT., 12" Pratt & Whitney, 1942
SLOTTER, 36" Rockford, Hyd., '44
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2H, 2K & 3H K & T Plain & Vertical Millers.
16"x16"x48" THOMPSON Type "C" Hydraulic Surface Grinder.
Nos. 1B x 74" and 1½B x 81" PRATT & WHITNEY Deep Hole Drills.

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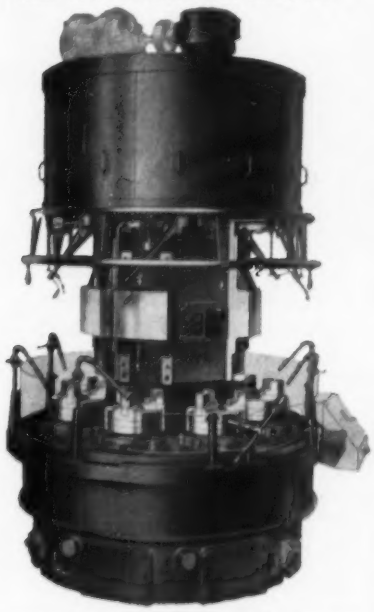
DETRICK & HARVEY 4" bar; Floor Type
GIDDINGS & LEWIS No. 0, 3⅛" spdl.; late
HEALD No. 49 Double End Bore-Matic; latest
LANDIS No. 35, 3½" Floor Type, M.D.
LUCAS No. 42 "Precision" Boring, Milling & Drilling; late type
SELLERS 5" bar Table Type; late type

BORING MILLS—Vertical

BULLARD 24", Vertical Turret Spiral Drive
BULLARD 36" High Speed 18" Extra High Column; latest
BULLARD 30"x20" Man-au-Trol Tables; late
NILES 36-44" Vertical Turret Lathe; M.D.



BULLARD 24" Vertical Turret Lathe; late type.

GEAR EQUIPMENT—FELLOWS

FELLOWS No. 6 High Speed Gear Shaper
FELLOWS 3" fine pitch Gear Shaper; late
FELLOWS No. 612 High Speed Gear Shaper
FELLOWS No. 7 High Speed Gear Shaper
FELLOWS No. 61A High Speed Gear Shaper, cap. 18"; late
FELLOWS No. 615 Gear Shaper; H.S.
FELLOWS No. 622 Hi. Spd. Gear Shaper; late
FELLOWS No. 7A High Speed Gear Shaper
FELLOWS No. 64 Gear Shaper; late type
FELLOWS No. 624A Gear Shaper; special
FELLOWS No. 645-A Gear Shaper; late type
FELLOWS type 645-A3 Hi. Spd. Gr. Shaper
FELLOWS No. 72 Hi. Spd. Gr. Shaper; M.D.
FELLOWS No. 13LS Lapper; Motor Drive
FELLOWS No. 20M Red Liner, New 1954
FELLOWS No. 24 Involute Measuring Instrument; late

GEAR EQUIPMENT—GLEASON

GLEASON No. 1 Flame Hardener; late type
GLEASON 3" Spiral Gear Generator; late
GLEASON 3" Straight Bevel Gear Generator
GLEASON 11" Bevel Gear Generator; M.D.
GLEASON 15" Spiral Bevel Cutter Sharp
GLEASON No. 6 Revacycle 5" cone distance
GLEASON No. 7 Hyp. Cutter Sharpener
GLEASON No. 12 Tool Sharpener; late type
GLEASON 12" Straight Bevel Generator
GLEASON 12" Spiral Bevel Cutter Sharpener
GLEASON 15" Spiral Bevel Finisher; M.D.
GLEASON No. 15 Quenching Press; late
GLEASON 18" Straight Bevel Gear Generator
GLEASON No. 4 Angular Hypoid Tester
GLEASON No. 12 Straight Bevel Gear Rougher
GLEASON No. 14 "Coniflex" Straight Bevel Gear Generator; late type
GLEASON No. 14 Spiral & Bevel Hypoid Gear Grinder; M.D.; late
GLEASON No. 18 Gear Tester and Lapper
GLEASON No. 20 Spur Gear Tester and Lapper
GLEASON 24" Bevel Gear Planer; M.D.
GLEASON 25" Spiral Bevel Gear Generator
GLEASON 25" Straight Bevel Gear Generator
GLEASON 25" Quenching Press; late type

GRINDERS—Cylindrical, Plain and Universal

BROWN & SHARPE No. 1 Universal; 10"x20"
BROWN & SHARPE No. 2 Univ.; late type
BROWN & SHARPE No. 3 Univ.; M.D.; late
CINCINNATI 14"x72"; Universal; Model ER

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LANDIS 4"x12" Type "H" Hyd.; Plain; late
LANDIS 10"x18" Type "C" Plain; Hydraulic
LANDIS 10"x36" Plain; Motor Drive
LANDIS 10"x36" Type DC Plain Hydraulic; with Inteed; M.D.; late type
LANDIS 16"x36" Type "C" Universal; late
LANDIS 20"x144" Plain Cylindrical Gap
LANDIS Type "D" 25"x72" Crank Pin Grinder; late
LANDIS Type "C" 18"x72" Plain; late type
LANDIS Type "C" 14"x72" Univ.; late type
LANDIS Type "DC" 10"x72" Hydr.; late type
NORTON 4"x12" Model CTU Plain; 1953
NORTON 6"x16" Type "C" Plain Cyl.; late
NORTON 10"x18" C Hyd. Plain; M.D.; late
NORTON 10"x36" Plain; Motor Drive
NORTON 10"x48" Type "C" Plain Hydr.; late
NORTON 10"x72" "C" Plain; M.D.
NORTON 14/22"x36" "C" Plain; Gap; M.D.
NORTON 16"x36" "C" Plain; Hydr. rapid inteed; M.D.; late
NORTON 16"x72" "C" Plain; Rapid Wheel Head Traverse; M.D.; late
VAN NORMAN No. 666, 48" ctrs. Crankshaft

LATHES—Turret

GISHOLT 1L Univ. Saddle Type; Timken; late
GISHOLT 2L Univ. Saddle Type; Timken; late
JONES & LAMSON 7A Univ.; Saddle Type; Timken; latest
LIBBY 1H6, 6" Hole, Long Bed; late
LIBBY 4H-12" Hole; M.D. Lathe; M.D.
MOREY No. 2 Ram Type; Timken; latest type
MOREY No. 4 Ram Type; Full Univ.; latest
POTTER & JOHNSTON No. 4D Automatic H.S.; Timken; late
POTTER & JOHNSTON No. 4D-5 Model "FCC"
POTTER & JOHNSTON No. 4D-6 Hi Spd.; late

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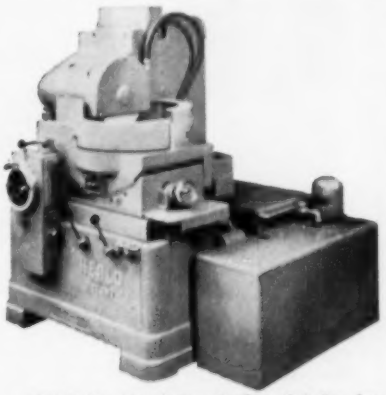
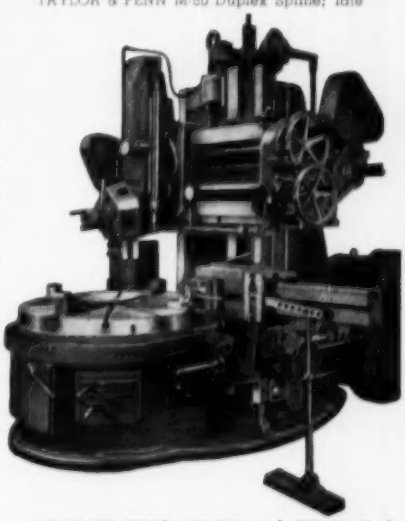


HEALD No. 261 Rotary Surface Grinder; late type.

POTTER & JOHNSTON No. 8DT Automatic Chucking & Turning; late type
WARNER & SWASEY No. 1 "Electric"; M.D.
WARNER & SWASEY No. 1A Univ. PRT; late
WARNER & SWASEY No. 2 ram type; Timken
WARNER & SWASEY No. 3 Univ. Ram Type
WARNER & SWASEY No. 4 Univ. Ram Type
WARNER & SWASEY No. 4-A; Univ. 9" Hole
WARNER & SWASEY No. 4 Univ.; Preselector Head; late

MILLING MACHINES—Manufacturing

BROWN & SHARPE No. 10 Auto. Plain; late
BROWN & SHARPE No. 12 Auto. Plain; late
CINCINNATI No. 2-24 auto.; Duplex; 1948
GOULD & EBERHARDT 25 Cont. type; M.D.
INGERSOLL 32"x24"x12' Adj. Rail Slab
INGERSOLL 32"x24"x16' Planer type; 2 hds.
TAYLOR & FENN M-30 Duplex Spline; late



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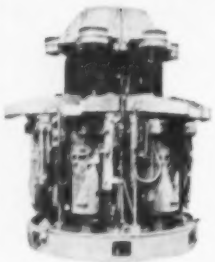

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1 spdl, 26" sw, #4M8 L-G, hydraulic
2 spdl, 24" sw, #3 Avey, AC MD
3 spdl, 20" sw, #2LM8 L-G, 1942
3 spd, 24" sw, #3M8 L-G, new 1942
3 spdl, 24" sw, #2M8 Allen, 1942
4 spdl, 14" sw, #2LM8 L-G, new 1942
4 spdl, 26" sw, #2LM8 L-G, new 1944
6 spdl, 20" sw, #1LM8 L-G, new 1943
6 spdl, 26" sw, #2LM8 L-G, new 1943
16 spdl, Fox #K50H, #2 taper, 1944

BORING MACHINES

100" N-B-P, 2 swivel hds, DC MD
Pratt-Burt Vert, 26" sw, new 1941
36" Bullard VTL, side hd, 1941
#49 Heald Borematic, new 1944

GRINDERS

6"x18" Norton Type C, new 1943
10"x18" Norton Type C, new 1943
10"x36" Norton Type C, new 1943
10"x48" Norton Type C, new 1943
10"x72" Hill-Clarke, AC Mot. Dr.
10"x96" Hill-Clarke, AC Mot. Dr.
16"-36"x36" Norton, angular wheel
14"x48" Landis Type C, new 1941
16"x72" Hill-Clarke, AC Mot. Dr.
16"-36"x72" Norton, AC MD, 1941
42"x72" Norton, extras, new 1947
18"x96" Hill-Clarke, AC Mot. Dr.
18"x120" Norton Plain Cyl.
20"x192" Norton, AC Mot. Dr.
24"x264" Norton, AC MD, Rebuilt
20"32" Gap x 144" Norton Pl. Cyl.
14"x48" Landis Type C Univ, chuck
18"x36" Cinn. Mod. ER Univ., 1942
#Wd615 J&L Thread Gdr, 1943
#B24 Arter Rotary Surf, new 1941
8"x36" Norton Cam-O-Matic, 1946
10"x36" Norton Cam-O-Matic, 1942
#5A Bryant Internal, new 1943
#16A-16 Bryant Internal, new 1943
#16-36 Bryant Internal, new 1941
#24-26 Bryant Internal, new 1941
#24-36 Bryant Internal, new 1941
#72A5 Heald Internal, new 1942
#72A5 Heald Bridge Type Int.
#8 Badger-Hanchett Double End Disc
#214 Besly Double End Disc, 1946

LATHES

#16ML-16 LeBlond, Semi-Auto, 36" cc
14"x36" Amer. Grd. Hd., MD
27"x84" Amer. Grd. Hd., MD
36"x120" Putnam Grd. Hd., MD
R14 Seneca Falls, 16"x30", 1942
120"x96" cc N-B-P, 80 HP, ser. 2300
#3 W&S, grd. hd, bar fd. Timken brgs.
#5W Cinn Acme Univ. Turret, 30" sw.
#2A W&S, Preselector hd, 1942
#3AL Gisholt, cross-slide tur, 1941
#7A J&L, 18" sw, tooling, 1942
#3H-10 Libby Horiz Duty Turret, 1942
#6A W&S Turret, new 1944
#48U Fastermatic, tur, 32" sw, 1944
#8D Potter & Johnston, new 1941

MILLERS

54"x30"x16 Ingersoll Slab, 1934
54"x8" Ingersoll Openside, 1942
10"x60" P&W Mod. B Thread Mill
#4T L-B Thread Mill, new 1942
12"x102" L-B Mod HT, Thread Mill
#66 Cinn. Vert. back lash, 1942
#4 Cinn Hi-Spd. Dial Type Pl, 1943
#36 Van Norman, Rebuilt, 1941
#1-18 Van Norman Prod. 1942

PLANERS

30"x36"x12" Rockford Openside '42
60"x48"x27" American, 4 hds.
60"x48"x30" Hamilton, 4 heads

MISCELLANEOUS

6" Goss & DeLeeuw, 8 spdls, 1941
#306 Barnes Vert Hone, new 1942
15 Ton Hyd. American Press, 1946
#11RD 2 Hd. W&S Tapper, latest
#12HS G&E, 12" cap. Gr. Hobber
#36BM G&E 3 Spdl, Bevel Gr. Rougher
#61A Fellows Gr Shaper, 18" cap.
#5A Kaufman Pneu. Tapper, 1947
16 ga. 42" Economy Power Shear
15 T Toledo Overhead Crane, 3½'

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24" Bullard Spiral Drive, 1943
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42" King, direct m.d. thru gear box
42" King with side head and plain swivel head on rail, 1940
44" Putnam, m.d., p.r.t.
44" Niles, m.d., p.r.t.
48" Niles-Bement-Pond Car Wheel Borer m.d.
53" Niles Heavy Pattern, m.d., p.r.t.
54" Bullard, m.d., late
73" Niles, m.d.
100" Niles Heavy, m.d., p.r.t.
102" Niles Wheel Turning Boring Mill
12' Niles, m.d., p.r.t.

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4 spindle Niles-Bement-Pond, m.d., 12' rail, No. 5 Taper
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No. 6 Barnes Twin Spindle
No. 306H Barnes Single Spindle
No. 224B Barnes Honing Machine, m.d.

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No. 601 W.D. Oster Geared Head Rapiduction, m.d., chucking
No. 1 Warner & Swasey "Electric", m.d., bar
No. 1A Warner & Swasey, m.d., 1940
No. 1L Gisholt Universal, m.d., 1943
No. 1, 2 Cincinnati Acme Full Universal, m.d.
No. 1-H-5 Libby, m.d.
No. 2A Warner & Swasey, m.d., preselector head, late
No. 2F Foster Fastermatic, m.d., Timken
No. 2L Gisholt Universal, m.d., latest type, 1945
No. 3 Cincinnati Acme Full Universal, m.d., chucking
No. 3 Foster Geared Head, m.d.
No. 3 Bardons & Oliver Universal Ram Type, m.d.
No. 3 Jones & Lamson, m.d., 1943
No. 3A Warner & Swasey, m.d., 1942
No. 3F Foster Fastermatic, m.d., Timken
No. 4 Warner & Swasey, cone, bar and chucking types
No. 4A Warner & Swasey, Universal, m.d., chucking, 1939
No. 4 Gisholt Universal, m.d.
No. 4L Gisholt Universal, m.d., 1943
No. 4FU Foster Fastermatic, m.d., latest, 1945
No. 5 Gisholt Ram Type, preselector head, m.d.
No. 5 Gisholt Universal m.d., late type, 1942
No. 7A Jones & Lamson Universal
⅝" Pratt & Whitney Hand Screw Machine, cone, bar
2½x24", 3½x32", 4x34" Jones & Lamson Geared Head, m.d., bar and chucking
18" Libby Type A, m.d., chucking
20" Acme, s.p.d., bar
20" Dreses, arranged for factory m.d.
26" Libby Type C, m.d., chucking

PLAIN CYLINDRICAL GRINDERS

No. 5 Brown & Sharpe Plain Cylindrical, m.d., 1942
6x15" Cincinnati Plain Hydraulic, m.d.
6x18" Cincinnati Model EA, m.d.
6x18" Cincinnati Model ER, Plain Hydraulic, m.d., Filmatic Spindle
6x18" Landis Type C Hydraulic, m.d., late
10x18" Cincinnati Plain Hydraulic, Model ER, m.d., Filmatic Spindle, 1943
10x18" Cincinnati Model EA, m.d.
10x18" Norton Type C, m.d., latest
10x36" Cincinnati Hydraulic, m.d.
10x36" Norton Type C, m.d.
10x72" Landis, m.d.
10x72" Norton, motorized
12x36" Landis Plain Self-Contained, m.d.
12x96" Landis Self-Contained, m.d.
14x36" Landis Plain Hydraulic, m.d.
14x52" Norton motorized
16x72" Landis Plain, m.d.
16"x72" centers Type C Norton Semi-Auto., Hydraulic
16x96" Cincinnati Plain Cylindrical, m.d.
18x72" Norton Type C, mechanical, m.d.
20x120" Landis Plain Self-Contained, m.d.

MANUFACTURING LATHES

12x33", 20"x25", Jones & Lamson Fay Automatic Lathes, 1944
12x18" Reid Small Piece Production Lathe, Model 6WSL, m.d.
No. 3 Lodge & Shipley Duomatic, m.d., late type
No. 3A Lodge & Shipley Duomatic, m.d., late type
W. C. Lips Carbo-Semi-Automatic, m.d., late
No. 4 LeBlond Boring Lathe, 32' bed, 4" hole, m.d., latest
No. 9, 12 LeBlond Multi-Cut, m.d.
4x60" LeBwing, m.d.
8x132" LeSwing, m.d., latest
11x18" LeBlond Rapid Production, m.d.
12x18" centers Monarch Model 5T, m.d.
No. 12 Gisholt Semi-Special Automatic Production, m.d.
N. 9WSL, Reid Production Lathe
17"x39¾" LeBlond Mfg. Type Production Lathe
17"x75¾" centers LeBlond Rapid Production Lathe
No. 10 Sundstrand Automatic Lathe

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Pratt & Whitney Kellering machines
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No. 56 Sundstrand centering machine.
24" No. 314 Baker Brother H. D. Drill.
9' Arm 16" Column American Radial Drill.
16 Spdl No. D20H Natco multiple drill, 1943.
36" No. 36H Gould & Eberhardt gear hobber.
No. 2 Cincinnati filmatic bearing centerless grinder.
4" x 12" No. 4H Landis plain hyd. cylindrical grinder, 1943.
6" x 30" Cincinnati plain hyd. cylindrical grinder, 1942.
13" x 60" Hanchett vert. spdl. surface grinder, late.
8" x 24" Norton horiz. spdl. surface grinder.
14" x 46" Hendey toolroom lathe, new 1940.
24" x 8' Bed LeBlond H. D. Engine lathe.
36" x 156" cc. Monarch "NN" engine lathe, new 1942.
126" x 96 ft. cc. Niles Bement Pond engine lathe.
Model 10 Sundstrand automatic lathe, late.
15" x 30" Lipe Carbo-Matic production lathe, 1942.
Model M-24 Kearney & Trecker simplex mill, 1943.
No. 2-20 Kent Owens mfg mill, hydraulic, 1941.
36" Rockford hydraulic openside shaper-planer.
36" Rockford hydraulic vertical slotter, new 1944.

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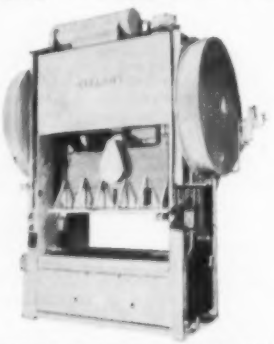

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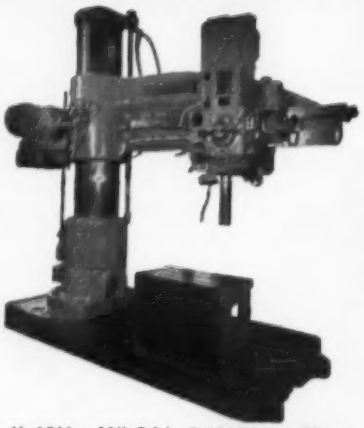
4'x15" CARLTON Radial Drill. Motor on arm.



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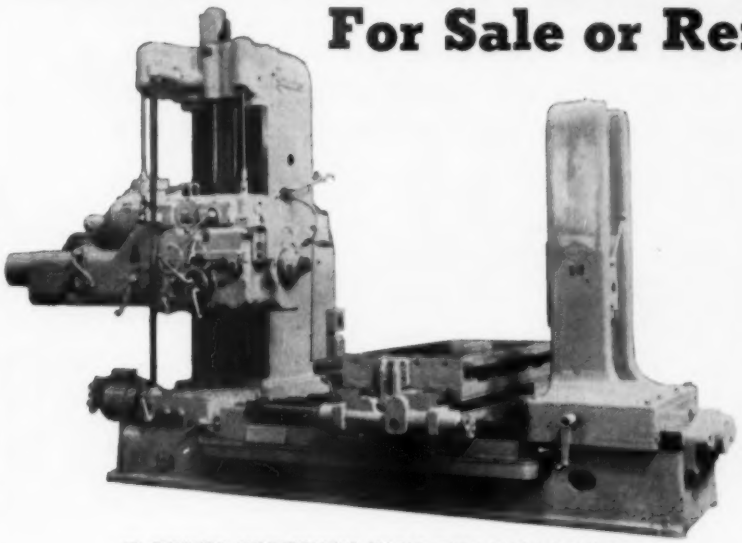

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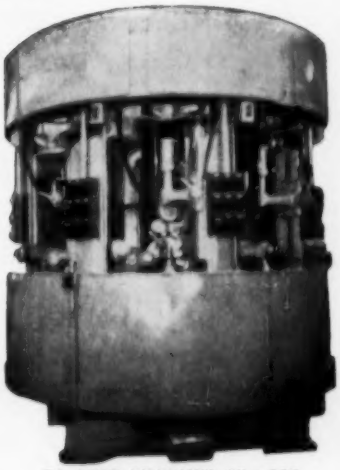

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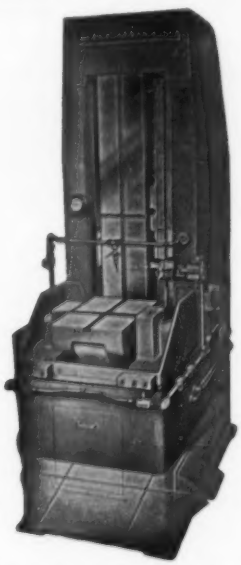

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1½ 6-Spindle Cone Auto. Screw Machine, Ser. 3067-Sk, '42
4" Sellers Horiz. Table Type Boring Mill, Ser. 04-1317 New 1942, Over size machine
330T Giddings & Lewis Boring Mill, Horiz., Ser. 6041, Comp. Elecs, New 1941
(2) 78" Betts Heavy Duty Vert. Boring Mill, Comp. Elecs. Ser. BR-1C9 and BE-1C-20, 1942
1212A Ex-Cell-O Double End Precision Boring Machine, Hyd. Cross Sldg. Table, Ser. 20517, New 1945
40-Ton La Pointe, Model SRV, Vert. Surface Broach, 66" Stroke, Ser. 43200, 1943
HP 100 La Pointe Broach, 50-Ton Cap., 78" Stroke, W/Outer Support, Ser. 52149, New 1952
#24 Gleason Straight Bevel Gear Generator, 35½" diam., Ser. 17916, New 1942
Type A Barber Colman Gear Hobber, Extended Bed, Power Down Feed, Serial 1363, New 1942
20" x 72" Cinn. Plain Cyl. Grinder, Filmatic Bearings, 84" Centers, Ser. 7BF1Y-2, New 1952
72" La Pointe Universal Broach Grinder, Ser. 52004, 1952
#36 Hanchett Rotary Surface Grinder, Ser. 346, New 1943
#2 Cincinnati Tool & Cutter Grinder, Ser. 1D2T1L-1932, New 1943
24½" x 28' Monarch Engine Lathe, 2 Carriages, 2 Taper atts., Rapid Traverse, Ser. 6806, New 1940
#22B Bardons & Oliver Saddle Type Turret Lathe, 4½" Hyd. Bar Feed, Hyd. Preselector Head, Ser. 17013, New 1947
16" x 54" Monarch Tool Room Model CW Lathe, Ser. 17468, 1942
30" x 16' Niles Engine Lathe, Ser. 21904, 1942
14" x 54" Lodge & Shipley Engine Lathe, Ser. 35524
22" x 72" Lehmann Lathes, Serials 5211, 5213 (2)
16" x 54" American Pacemaker Engine Lathe, Speeds 1500 RPM, Ser. 61770-40, New 1940
3FU Foster Fastermatic Automatic Turret Lathe
4FU Foster Fastermatic Automatic Turret Lathe
#4 Cincinnati Hi-Speed Dial Type Plain Mill, Ser. 4A4P1L-132, '42
#3H Kearney & Trecker Universal Mill, Ser. 93-4228, 1943
#4 Cincinnati Hi-Speed Dial Type Vert. Mill, Ser. 8A4V1K-35, '41
36" Rockford Hydraulic Vert. Slotter, Ser. 47-S1-85, New 1946

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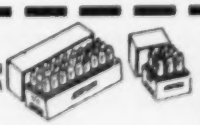

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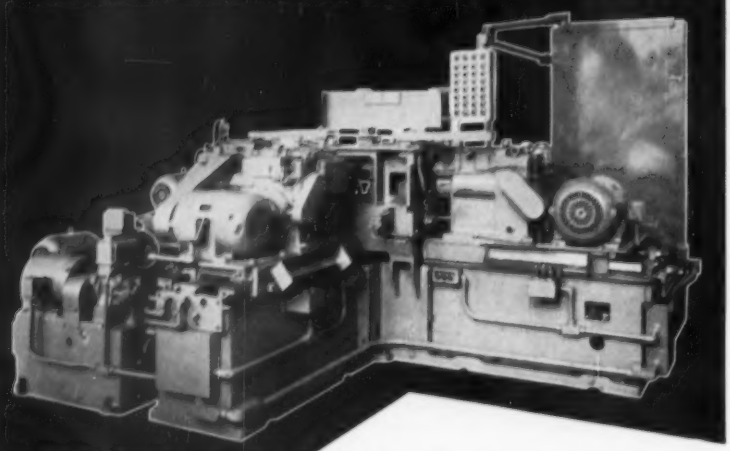

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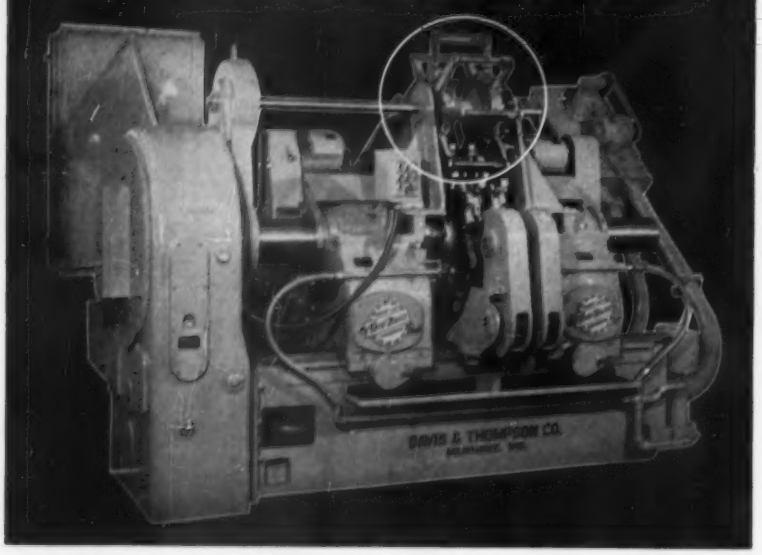

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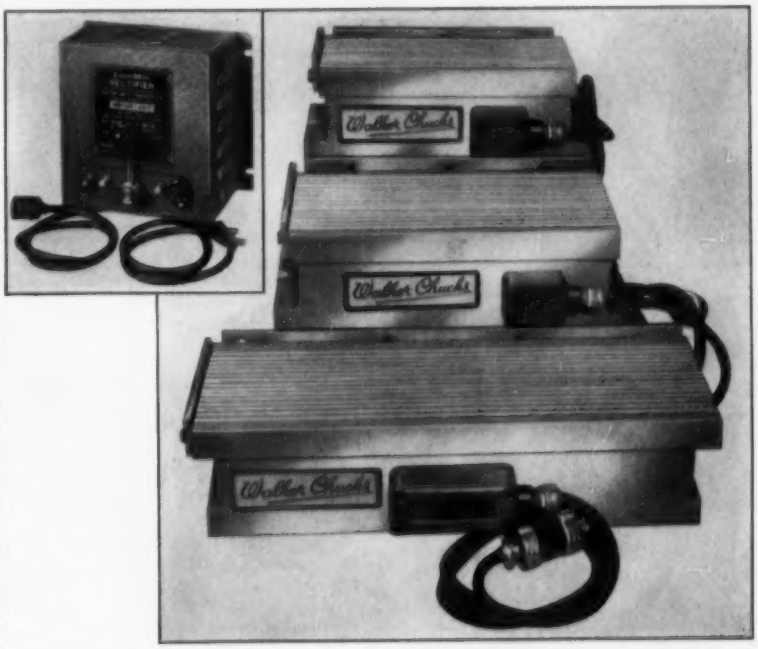

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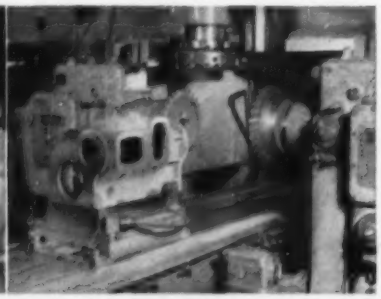

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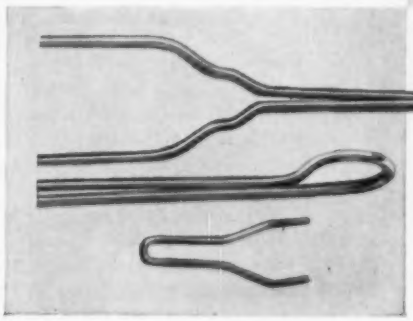

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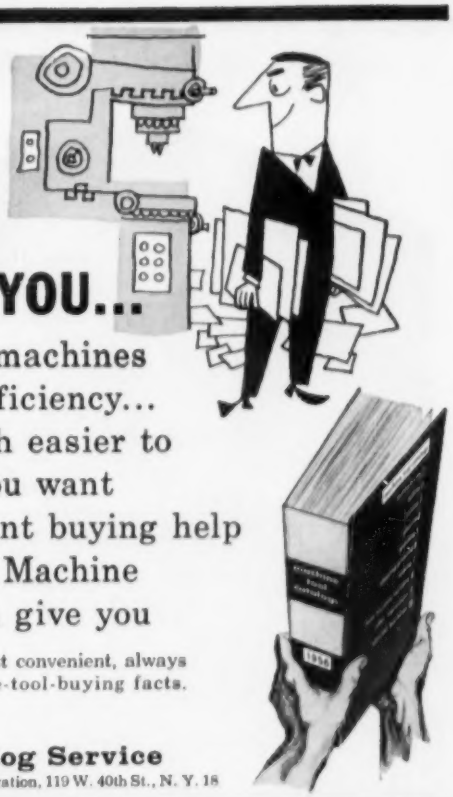

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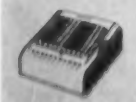
FOUND WHERE FINE BUSINESS MACHINES ARE "BORN"

GRAND RAPIDS GRINDERS

INTERNATIONAL BUSINESS MACHINES

SMITH-CORONA



COMPTOMETER

REMINGTON RAND

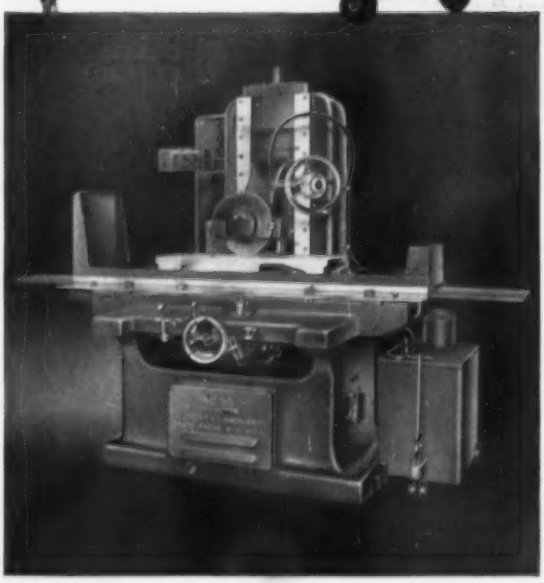
UNDERWOOD

R. C. ALLEN

Producing an intricate business machine requires exceptional toolroom precision. That's why these manufacturers use Grand Rapids Grinders . . . engineered to achieve extraordinary grinding precision at cost-cutting speed.

Model No. 55, at right, offers such features as one-piece column and base for permanent, vibrationless alignment, wheel head with powered rapid vertical travel, hydraulically actuated cross feed and longitudinal travel table. And it's the fastest grinder of its size and type, with a variable table speed up to 125 fpm!

Whether you make business machines or bulldozers, you can count on Grand Rapids Grinders for maximum toolroom precision.



GRAND RAPIDS NO. 55 HYDRAULIC FEED SURFACE GRINDER. Table speed up to 125 fpm. Working surface of table is 12" x 36". Vertical movement of wheel head is 18". Preloaded ball bearing spindle greased for life. Spindle speeds 1925 and 2500 rpm.

GALLMEYER & LIVINGSTON

A note on your letterhead will bring complete details.

GALLMEYER & LIVINGSTON COMPANY

430 Straight Ave., S.W., Grand Rapids, Michigan

INSIDE INFO FROM HOLO-KROME

THE SECRET'S IN THE SOCKET!

Holo-Krome carefully controls the socket depth. Sockets are deep enough for the hex key to get a firm, solid bite . . . yet scientifically proportioned to give maximum strength to the head of the screw. Accurate design is another plus you get when you specify Holo-Krome.

H-K controls socket depth for tougher screws!

Compare These Other H-K Features!

SHARP HEX CORNERS . . . where the hex key gets a solid grip for firmer fastening.

UNTAPERED WALLS . . . for better key fit, longer key and socket life, even tighter wrenching.

COMPLETELY FORGED SOCKET HEAD . . . no drilling or broaching—metal fibers stay intact for stronger hex sockets.

For the finest in Socket Screw products . . . for revolutionary SAME-DAY SERVICE, the name to remember is Holo-Krome!

LOOK INSIDE A HOLO-KROME SOCKET!

Send in the coupon below and we'll send you FREE an H-K Socket Cap Screw (we've omitted heat treating to let you get a better look at the mirror finish and sharp hex corners under the usual black finish). Look it over carefully, and see for yourself what a real difference H-K quality and skill can make!

Please send me FREE a Holo-Krome Socket Screw for my inspection.

NAME _____

POSITION _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

HOLO-KROME

THE HOLO-KROME SCREW CORP., HARTFORD 10, CONN.

Sold only through authorized Holo-Krome distributors.

New design cuts setup time— TIMKEN® bearings up precision

BECAUSE it has no cams to change, this Warner & Swasey 2AC Single Spindle Chucking Automatic sets up fast like a turret lathe, gives you automatic operation without the usual time-consuming setup procedures.

And among the many design features contributing to the lasting production accuracy of the 2AC is the mounting of the spindle on Timken® tapered roller bearings.

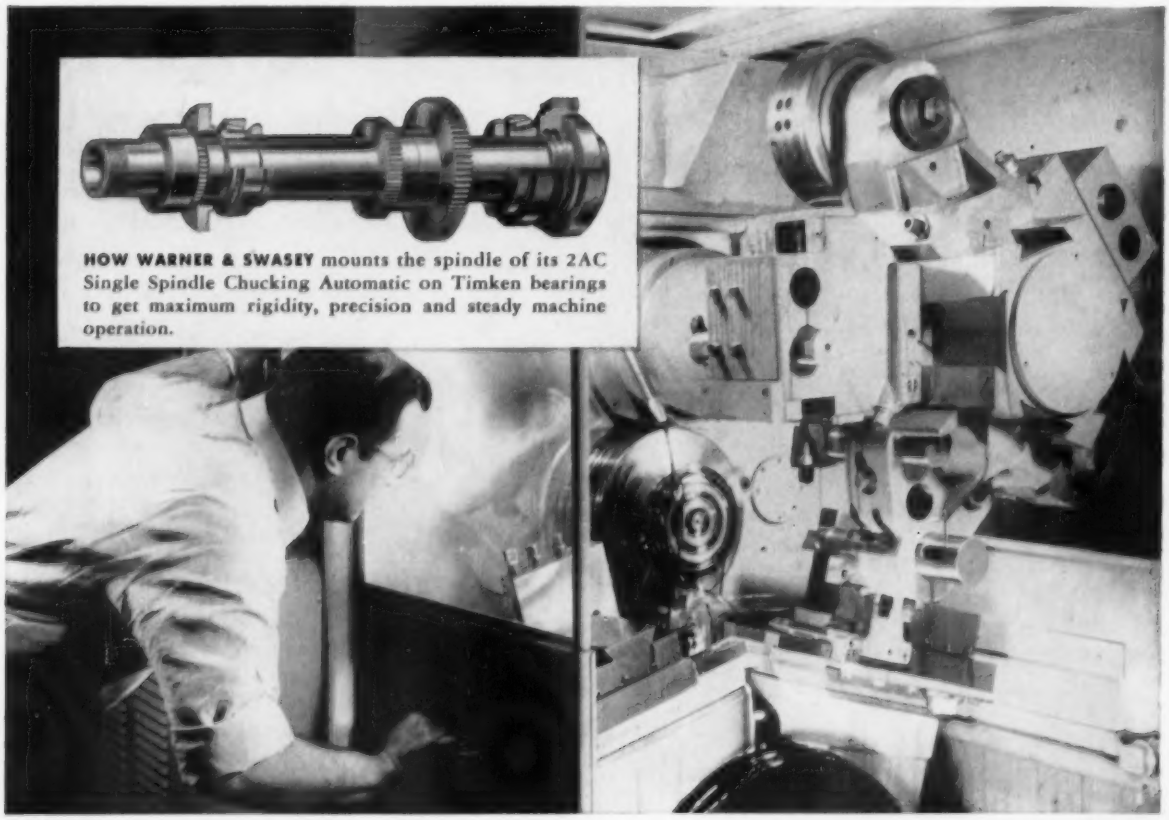
Because of their tapered design, Timken bearings take radial and thrust loads in any combination, hold the spindle in rigid alignment.

Full line contact between Timken bearing rollers and races provides maximum load-carrying capacity. And, because Timken bearings are built to last the life of the machine, maintenance costs go down.

Timken bearings also save power because they practically eliminate friction. They are geometrically designed to give true rolling motion, precision manufactured to live up to their design. And to be sure we get steel good enough for Timken bearings, we make our *own* fine alloy steel. We're America's only bearing manufacturer that does.

No other bearings give you all the advantages that Timken bearings give you. That's why so many manufacturers of equipment that *must* have dependable bearing performance use them. Whether you buy or build machinery, be sure to specify Timken bearings. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable: "TIMROSCO".

This symbol on a product means its bearings are the best.

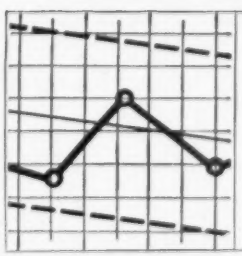


HOW WARNER & SWASEY mounts the spindle of its 2AC Single Spindle Chucking Automatic on Timken bearings to get maximum rigidity, precision and steady machine operation.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



STATISTICAL QUALITY CONTROL

To insure uniform high quality and closer tolerances, the Timken Company uses statistical quality control. With it, tolerance deviations are plotted graphically. It's one of industry's newest, most scientific methods of improving product uniformity.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ▯ AND THRUST —▯— LOADS OR ANY COMBINATION